

March 18, 1957

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AVIATION WEEK

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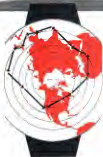
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3

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* Upper sequence of 22 photos shows a 21" long x 2" I.D. x 0.155" wall thickness. Finished part, shown at far right. Hydrospin is this part, a 21" long x 2" I.D. with 0.250" wall thickness.



* Lower sequence of photos shows a 14" high x 10" diameter. Finished part, shown at far right. Hydrospin is this part, a 14" high x 10" diameter with 0.250" wall thickness.



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MARCH 18, 1957

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COVER: Bell X-15 First Prototype, Loaded with Rocketry, Expected to

show off new company's P-1. While, this, plus the concept of the P-1 flight test program, presented in a November 1956 issue, the X-15-1 can carry a payload and cruise at 100 Kts. At 400 Kts. the first turbine-powered helicopter produced in quantity for the armed forces, according to the manufacturer, the X-15-1 was specifically designed for maintenance in the field as detailed in previous layout and story on page 68-69.

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EDITORIAL

Ballistic Missile Development Is No Monopoly

Unfettered leaders of the Army's Ballistic Missile Agency at Huntsville, Ala., have been operating a smoke-screen of amnesia on the history of ballistic missile development in this country as part of their desperate effort to return a place in the long-range missile picture.

We have no quarrel with the Army attempt to continue its own ballistic missile development program at the Redstone Arsenal. Nor would we attempt to denigrate the abilities and achievements of the talented team of former German Peenemunde experts headed by Wernher von Braun. It is significant that, to date, none of these deliberate distortion of facts has emanated from the civilian scientist group at Redstone whose technical abilities are well recognized by all of their competitors.

Perhaps the biggest myth fostered by the Army authorities is that this service is the only military organization with ballistic missile experience and that both the Navy and USAF are "Jehonads come late" in this field with the Polaris, Titan, Atlas and Titan. This is pure hogwash.

The Army Ordnance Corps has a long history of ballistic missile development, reaching back more than a decade to the modest V-2 Hermes Corporal and, finally, the 200-mile range Redstone.

But both Germany and North American Associates were actively developing ballistic missiles from 1946 onward under USAF contract. The successful test firings of the Convair MX774 at White Sands in 1946 was a major advance over the German V-2 type of missile. The MX774 proved the feasibility for the first time of using solid rockets to maintain stability in flight in strong winds. The carbon cases used by the Germans for the same purpose.

Although badly handicapped by lack of funds, Convair continued its ballistic missile work throughout the post-war decade until it merged into the full-blown Atlas ICBM project of today. It is noteworthy that Convair already has delivered an Atlas prototype to the USAF Missile Test Center at Patrick AFB, Fla., for experimental firing.

The Navy too has accumulated a considerable store of successful experience with ballistic test missiles during the past 10 years, with the Mathe Viking high-altitude research rockets and the Argojet Aerobol rockets. The Mathe Viking program, particularly, added a substantial increment to state-of-the-art development in the ballistic missile field.

One of the other Army myths is that it is at least two years ahead of USAF and Navy in intercontinental range ballistic missile development (1,000 mile range) because it fired a Jupiter test vehicle 3,000 miles downrange from Cape Canaveral last fall. This 3,000 mile shoot was

a noteworthy research achievement, but it did not involve an operational type missile. The test vehicle consisted of a Redstone first stage, followed by a cluster of four Sergeant with the final stage consisting of a single Sergeant carrying a payload not much heavier than a box of straws. The fact is that both the USAF Thor built by Douglas and the Jupiter developed by von Braun's Redstone Arsenal team are in the experimental prototype test stage at Cape Canaveral, and both are being plagued by the typical early stage problems of new missiles.

We think the Army should strengthen its case for staying in the missile picture unassailable if it stuck to the facts and abandoned its attempt to bamboozle the public with technically inaccurate myths.

Jet Noise Problem

Second transcontinental flight of the Boeing 707 jet transport again thrusts the spotlight on the stubborn refusal of the Port of New York Authority to permit even occasional experimental operations of jet transports on its four metropolitan airports. Banned from New York, the Boeing 707 and B-747 Superjets flyday as part of its custom turned for the three-hour, 40-minute flight.

The Port Authority has been consistent in its ban on jet transports. Over the years, it has turned the Canadian Aero Jetliner, the British Comet, the U.S. Boeing 707 and will probably turn the French Caravelle although it doesn't object to the high-pitched roar of the Vickers Viscount.

We can understand the Port Authority's concern over the jet noise level of regular airline operations from commercial airports. We believe the manufacturers of jet engines and airlines share this concern and are working hard developing devices that will reduce the external noise generated by jet transports to a reasonable level. It is the time the airlines are ready to put jet transports into service that this annoying device do not meet Port Authority's requirements, we think this leads to have a legitimate case for banning jet operations. But as the increasing air traffic is refused to let a jet transport into the New York area on one short experimental turn studies as to being seriously short-sighted. The people of New York, the Port Authority, the airlines and all other concerned might have a little more about the problems of jet transport operations from these occasional trips by a mode rarely of experimental types. Little can be gained by the Port Authority's continued reticence on this issue.

—Robert Hite



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heart
of
the
jet . . .

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WHO'S WHERE

In the Front Office

Frank E. Perry, president and treasurer, newly organized Wyman-Gordon Corp., Warren, Ariz. Also **Leon A. Wilson**, Jr., vice president-sales.

William E. Koyler and **James V. Lott**, vice presidents. **Stratford Steel Co.**, Jacksonville, Fla.

Philip J. Chase, vice president-manufacturing. **Kalpak Corp.**, Via Noyl, Calif.

George G. Hanks, vice president research and development. **Protonics Research Corp.**, Thousand, N. Y.

G. M. Matsumura, vice president and general manager, **Hydronic Research and Manufacturing Co.**, Burbank, Calif.

L. G. Evans, vice president and general manager, **McDonnell Mfg. Co.**, Mantoloking, Calif.

Don G. Leith, vice president-sales and engineering. **Entero Air Devices, Inc.**, Davis, N. Y.

Frank E. Turberville, assistant to the president. **Orlando Engines Limited**, Madison, Ontario, Canada.

Harvey H. Schindler, chief design division, **Boeing Air Operations**, Civil Aircraft Division, Boeing, Washington, D. C.

Honors and Elections

Al Paul Mouton, chief engineer (helicopters) of **Industries**, has been awarded the "James H. Brown Memorial Trophy." The trophy is awarded annually by The Royal Aero Club for meritorious achievement in the development of helicopters or other vertical lift aircraft.

James N. H. Greenfield, chief design officer of **Konstant Aircraft Limited**, was a member of the award who has been awarded the **James H. Brown Memorial Trophy**. The award, given by the **Central Air Force and Air Navigation of London**, is the British equivalent of the **Mouton Trophy**, Canada's premier aviation award.

Changes

Clyde Floyd D. Hall, director flight operations, **Town World Airlines, Inc.**

Robert J. Gies, management/marketing, commercial sales dept., **Boeing Aircraft Corp.**, Wichita, Kan.

W. F. Smith, operations manager **Marine Systems**, various projects, **The Marine Co.**, Baltimore, Md.

Paul Mackwell, assistant chief engineer **Boeing Air Transport Ltd.**, Bristol, England.

Charles M. E. Koenig, Jr., assistant general manager, and **William E. Diehl**, assistant to managing manager, **Stratford Steel Co.**, Via Noyl, Calif.

Frank Doughtice, customer relations staff (F77 corporate sales), **Franklin M. Engle and Company Corp.**, Hagerstown, Md.

INDUSTRY OBSERVER

Several manufacturers who have military aircraft in the design stage have proposed powerplant changes in the government that could bring a 50% increase in output and speed approaching Mach 4 in some designs. Proposals call for including rocket engines in combination with the originally planned turboprops.

Complete 40,000-lb. thrust rocket engines for North American's **Norfolk** missile are being fabricated by **V. & F. Inc.** of Folsom, which had been manufacturing the missile body for the **Norfolk** (NAF No. 25, p. 69), but delivered in and completed another five of the engines, which were designed by **Curtis Wright**.

Lincoln Laboratories' EX-2 computer, a large experimental unit for the **SAGE** system, is scheduled to begin operation this spring or summer. The computer incorporates 22,000 transistors and 600 vacuum tubes. Capacity of its memory unit is 16 times that of any other memory unit working in a computer today.

Solar Aircraft Co., San Diego, is testing stainless steel heat-resistant aluminum disks for an advanced version of the already relatively lightweight **General Electric J79** turbojet engine. In the project, Solar is using a new furnace with a six-ft-by-10-ft capacity.

Stanley Aviation Corp.'s new pilot ejection system for the Navy will be built around a monopropellant, liquid-fuel control rocket motor fired from a tube by a solid propellant charge. Rocket was developed by **Falco-Tyson Corp.**, Naval Rocket Test Station, Lake Denham, N. J.

General Electric is collecting operational data on its J79 turbojet engine independently of USAF at Edwards AFB, Calif. GE, which has three pilots and about 200 supporting personnel at the base, is using a **McDonnell F-101**, **Douglas F4D** and **Lockheed P-80A** in its program.

Republic J100 two-seat tactical fighter will undergo its flight test program from the French air force test center at **Ormer**. The aircraft, constructed entirely of bonded material, is equipped with two **Turbojets** General jet engines, with each developing a thrust of 2,400 lb. NATO version of the fighter is being equipped with a **British** engine.

New KC-135 USAF jet tankers have come off the line at Boeing's Renton, Wash. plant. KC-135 is being built on a modified **airframe**, built with Boeing's 707 jet tankers, but only the rear section of the civil commercial aircraft is complete.

Boeing is still interested in building a medium-range turboprop transport to compete with the **Convair 440** but wants an engine in the 5,000-hp thrust class before it goes any further in its planning.

Electronic equipment required as estimated 60% of the total cost of an air-to-air combat missile, including the missile and its supporting infrastructure.

Boeing has selected a controlling interest in **Matra**, French guided missile firm.

France's **Matra** aircraft company is developing an **agile** version of its **Bombardier** **Matra** plane. The aircraft is being fitted with **space** equipment constructed in **Great Britain** by **Boeing Aircraft**. **France** Air Force is interested in the plane for work in **North Africa**. (*Drawing of Super Bomber* enlarged version is on p. 41.)

New look at Japan's defense program may be necessary. Recent maneuvers indicated that the six-year of Japan's Air Self Defense Force would be capable of intercepting only 10% of incoming enemy bombers. F-86Fs, one of Japan's strongest under the present voluntary defense program, were used by the defending forces in the exercises.



HOW THE SILICONES MAN HELPED...

Deliver a Hot Blast to Cold Jets!

Get 'em into the air fast! But complex machinery must be warmed up... and pumping high temperature, high pressure air into the jet engine isn't ordinary work. The solution? A tough, flexible hose with two inner layers of high temperature silicone rubber bonded to an outer cover of ribbed neoprene "Dacron" fiber.

Developed by Quaker Rubber Division H. K. Porter Company, Inc., Philadelphia, Pa., this hose allows Union Carbide Silicone Rubber to resist temperatures from +450 to -80 deg. F. Weighing less than one pound per foot, it offers great flexibility for ease of handling, and is highly resistant to abrasion.

This is another example of how the Union Carbide Silicones Man has helped solve an "impossible" problem. A booklet—"Look to Union Carbide for Silicones"—describes silicone rubber and many other silicone products. Write Dept. Q-65 today. Silicones Division, Union Carbide and Carbon Corporation, 26 East 52nd Street, New York 17, N.Y.

The name "Union Carbide" is a registered mark of UCC.
In Canada: Canada Air Products Company, Division of Union Carbide Canada Limited, Toronto.



Washington Roundup

Twining In: Quarles?

Selection of USAF's Gen. Nathan F. Twining to succeed Adm. Arthur W. Radford as chairman of the Joint Chiefs of Staff was assumed by the White House last week, but there are growing doubts that USAF Secretary Donald A. Quarles will become Secretary of Defense.

Twining's obvious new role that President Eisenhower will feel pressure from Army and Navy interests opposing the award of both top Defense Department posts to USAF. In addition to this, Quarles is a relatively young associate with a correspondingly low political position.

He will be recommended for the job by Defense Secretary Charles E. Wilson, but Republican regulars are expected to offer some other candidate.

Previously mentioned to succeed Wilson are Neil H. McElroy, president of Procter and Gamble, top manufacturer; and H. Lee White, New York export trade lawyer. More often during World War II and former Assistant Secretary of the Air Force for Manpower.

There still is no indication of plans by Wilson to retire.

He announced last week that he intends to hold his annual conference with military leaders at Quarters, Va., between June 13 and June 16.

Exodus in Defense R&D

Widespread exodus of disenchanted scientists and technologists from the Defense Department's research and development offices.

The office is now in a state of "suspended animation," waiting to be reeled down and made part of Assistant Secretary Frank Newbury's Engineering operation (AW March 4 p. 28). Thus far, Newbury has given no indication of just how the merger will be worked out or which details will be changed.

Meanwhile, the number of industry telephone calls to the office have increased. Only a few hours after Newbury's move to fight to control the Defense Department research and development effort, industry spokesmen began calling in search of talented personnel. The job offers are good, but, as for the staff members have defected en masse out of them. They will make them more once Newbury shows the direction in which he intends to go.

Newbury's First Assignment

First assignment for Frank Newbury's new Defense Department Office of Research and Engineering—to recommend action that will result in more productivity from the nation's engineers. Newbury says Defense Secretary Charles E. Wilson has ordered the study on the premise that both industry and government face but are entangled in their use of engineering talent. Newbury will look for places to lighten procedures on drawings and specifications, building practices and the administration of development contracts. The administration says he also intends to increase the emphasis on research, but it is not the mission of the Defense Department to be the first "to take a photograph of the other side of the moon." He also feels, along with

Wilson, that the money going into the Vanguard satellite project has "no direct connection" with the military mission.

More Money For Vortec?

President Eisenhower now wants an additional \$25.5 million increase in the Fiscal 1958 appropriation for Vortec air navigation equipment. He also has received a \$5.5 million reduction in Civil Aeronautics Board's appropriation for airline subsidies. His proposed changes would:

- Increase Civil Aeronautics Administration's Fiscal 1958 allocation for air navigation facilities from the \$199.5 million in proposed in January to \$177 million.
- Reduce the allocation for airline subsidies from the \$51.5 million proposed in January to \$47.3 million.

The annual CAA navigation equipment estimate costs \$19 million for Vortec. The additional \$25.5 million a refund, the President said, to make the basic structure of air routes available for July 1, 1958. He said the reduction proposed in the subsidy allocation stems from a re-estimation of Fiscal 1958 expenditures by the CAB.

Jet Flap, BLC 'Impractical'

Four leading aircraft manufacturers say use of boundary layer control and jet flap principles to reduce runway length requirements will not be economically practical for conventional jet transport operations.

- **Convair:** Growth factors of jet transports will increase runway requirements. Jet flaps and boundary layer control will be used to increase runway length and landing distances, but cannot be expected to provide runway lengths shorter than those needed by current jet transport.
- **Lockheed:** Wing-tail vortex shedding has demonstrated high lift characteristics from jet flaps, but excess of the wing to the ground on takeoff and landing limits the lift increase.
- **Douglas:** Effects of boundary layer control in increasing maximum lift coefficient in practical transport aircraft has been exaggerated.
- **Boeing:** Newer concepts of jet flap and boundary layer control show certain capabilities. However, weight increase necessary to operate the system will result in the need for almost the actual takeoff runway required now.

Airways Plan

An traffic control system to be proposed later this spring by President Eisenhower's Aviation Facilities Planning Group will include answers for "see and be seen" operations. The answers will be separated from current operating and design problems. A third program will be introduced for pilots who can sight and communicate but not necessarily be able to fly under basic IFR conditions.

James L. Aselt, in the first paper on the program of the group, said many concepts of present air traffic control procedures should be retained in the framework of a modern control system. Indications are: be said, that air traffic can be handled for the next 20 years without experiencing "unavoidable costs increase; or delay to the user." —Washington staff

USAF Team Denied Entry at Redstone

Army, in all-out battle to keep IRBM, bans USAF evaluation group from arsenal on Medicare orders.

By Claude Wines

Washington-Army Ballistic Missile Agency, in an all-out battle to save the 100-mile Jupiter intermediate range ballistic missile, in a long-range effort to keep the missile in service, has denied admission to a USAF evaluation team sent to Redstone Arsenal in Huntsville, Ala., on short notice from Defense Secretary Charles E. Wilson.

The USAF officers were turned away from Redstone at the direction of the commanding officer, Maj. Gen. John B. Medaris, according to information received by AVIATION WEEK. The incident took place shortly after Wilson issued his famous order that Wilson should keep launch sites and weapons in readiness for use in which he denied employment of the land-based IRBM safely over to USAF (AW Dec. 1, p. 30).

Nickerson Carries Battle

A second directive, Assistant Weapons Director, ordered USAF to evaluate the work done on Jupiter and take action to eliminate the project after evaluating whatever developments were considered to have merit. The project was never carried out, and USAF stopped sending the resources to Redstone Arsenal after Wilson indicated in late February that he would permit the Army to finish some scheduled firing tests of Jupiter, despite the fact

that he considered the missile already obsolete.

Major Army missile experts make no secret of their almost explicit contention that the Wilson order was an arbitrary and capricious decision. Leading the Army to suspect with a range of 200 miles, they agree, will severely handicap it in fighting a nuclear-age war.

It was clear last week that Army missile men wanted their hope for a revival of Wilson's order on the case of Col. John Nickerson Jr., a senior officer at Huntsville, who has court-martialed at Redstone last month. He is accused of giving top secret information to unauthorized persons of military and the press.

Nickerson already has received a stern reprimand in his own defense and appeared in court to meet before some jury again. In both cases, he has ignored the charge that he has violated security regulations and conducted his attack upon the Wilson decision to deprive the Army of the missile.

Wilson Decision

Nickerson will face two charges and 17 specifications according to Articles 92 and 134 of the Uniform Code of Military Justice. He is accused of turning five documents over to unauthorized persons. Those included a 12 page study by Nickerson entitled "Consider-

ation of the Wilson Memorandum." Wilson's decision to give USAF the primary role in selecting the land form for a single IRBM and to have Jupiter "conducted in effect," has resulted in a range test of Army disapproval, particularly in Nickerson's defense.

Portuguese observers feel that the missile was begun coming to a head several years ago when all branches of the armed forces started development in the field.

Those observers do not claim that Wilson necessarily has found the right answer in the case of the IRBM, or intermediate range ballistic missile, but they give the secretary credit for finding an answer and saving the missile industry to carry it out.

Memorandum Battle

Ignoring the charge that he has violated security in giving top secret information to unauthorized persons, Nickerson made it clear in his study report that the Army is not accepting the Wilson memorandum without a battle. There is no doubt that he is getting moral and technical support in opposition to the memorandum from some of his superior officers, including Gen. Medaris, but Army spokesmen insist they are not exploiting the Nickerson case.

The conflict has not denied that he violated the security regulations. To "clearly his intention" he has argued the following points:

- Army scientists and engineers, including the Redstone group, have demon-

strated the superiority of Jupiter over other missiles.

- Army needs the IRBM as an operational weapon to reduce casualties and to destroy enemy missile sites.

- Army maps, communications and field experience are vital to successful operation of the IRBM.

Actually, the successful firing of Patrick AF-8, Pt. 2, last year was of a Jupiter test vehicle built in three stages—a Redstone rocket, four Sergeant rockets and a single Sergeant. Prototype models of both the Jupiter and Thor are now at Patrick. They are in a composite state of development, and neither has had a successful firing.

So far, the USAF budget for FY 1958, now before Congress, includes no money for continuation of the Jupiter project, and it is almost certain that some will be added under Army's budget of potential future weapons changes. There has been no decision on how termination costs of the project will be met.

British Army Given Own Light Aircraft

London—British Army shortly will take over from the Royal Air Force full responsibility for aircraft up to a maximum gross weight of 6,000 lb.

Details of the hand-over are now being worked out. It will include both fighters of the Starfighter type as well as Auster type light wing aircraft.

A government spokesman says Army requirements for light aircraft are increasing for use in various roles, including air-borne observation, communications, and reconnaissance.

Four J73s, 'Lots of Plumbing' Used in Nuclear Turbojet Test

By Robert Casham

Philadelphia—Four J73 engines were used by General Electric Co. in the last test of a turbojet engine powered exclusively by heat from a nuclear reactor.

The surplus J73s were modified by removal of their conventional chemical fuel combustion cans. Gas power discharge air was directed through a heat exchanger system, producing a turbine in the test and, "a hell of a lot of plumbing."

Because of heat exchanger and major temperature limitations, only 1,800°K could be attained in the reactor and 1,400°K at the engine turbine inlet.

Far From Hardware

From the description of the test, obtained by AVIATION WEEK at the 1957 Nuclear Congress here, the experiment indicated some degree of feasibility that the actual hardware is far from the concept, lightweight standards necessary for success.

The test took place under Atomic Energy Commission's supervision at AEC's National Reactor Testing Station, Idaho Falls, Idaho (AW Feb. 18, p. 14). Whether the engines, now used singly or clustered about the heat exchanger will be not indicated.

The engine was a new development based on the J73 series and was tested out for use in the North American F-105.

So far as whether nuclear applica-

tions are concerned, one USAF spokesman told AVIATION WEEK that the recent cutback in funds had put the W-73S and other nuclear programs at a standstill. The cut back has particularly slowed up the engine side of the program.

General Electric, which had an extensive exhibit at the display here, and in a booklet distributed that turbojets with a single reactor as a source of heat are currently favored over the turbofan as the powerplants of a nuclear aircraft.

If a propeller type propulsive system is chosen, GE points out, each propeller must have its own reactor or heat source, which undoubtedly will become more and more restrictive in passing through the reactor must be passed through the reactor around the engine from a single centrally located source.

Low Fuel Investment

Because of the shielding weight, more than one reactor is undesirable, and furthermore multiple reactors would increase the nuclear fuel investment and a low fuel investment per airplane is considered desirable.

The booklet by Dr. M. C. Lovett, chairman of development literature of the General Electric Aircraft Nuclear Propulsion Dept., Evendale, Ohio, listed five other nuclear propulsive systems including the turbojet.

- Propulsion driven by turbines in turn run by expanding through their vapor



Pod for B-58;
B-58 as Pod

Current B-58 bomber is designed as an aircraft to carry various weapons pods like the one being tested by the installation (above) at Carswell F. Wright plant. B-58 itself was turned into a pod when it was decided it would be cheaper to build a pod on a Wright-Fairchild F-105 than to build the B-58 itself. The B-58 was turned into a pod by removal of its main engines. Flight last week was made with landing gear down at the end. B-58 is designed to carry pods up to 50 ft. long and 8 ft. in diameter with systems for bombs, rockets, missiles, etc.



CAA, ALPA Meet to Smooth Relations

Washington—Airline pilots and the Civil Aeronautics Administration will meet later tomorrow in an unprecedented joint conference session in an effort to ease tensions and relations between the two groups.

Widespread differences between the Air Line Pilots Assn. and the CAA began approximately eight months ago and stem from ALPA's growing concern over the safety of pilot certification by the CAA to subsequent courses in the CAB hearings.

Pilot Remarks

The plan to link the two groups together is the result of an impromptu visit by CAA Administrator James Pyle in an address at the ALPA Safety Forum in Chicago earlier this month. In his speech, Pyle called for an improvement in relationships with the pilots' association by being "open and share the board in all our dealings." He then added in an off the cuff remark:

"I proposed to me that we establish a joint CAA-ALPA ad hoc committee on working group to take up such matters of common concern as our problems be followed after accident or serious violations."

The proposal was positively accepted by an ALPA member sitting in auditor of ceremonies at the occasion.

ALPA has vigorously protested CAA's action in conducting cockpit interviews following actual investigations of accidents or violations as grounds that such action propagates an enforcement role and is likely to establish precedents during the Civil Aviation Pilot's Board also known as the CAA of unnecessarily "clipping down the CAA" in some cases.

Pilot Cooperation

Pyle held Assistant William Hall back that "We don't expect all items of an investigation being taken any action and make every effort to work closely in cooperation with the pilot community. He added, however, that "we don't intend to allow in our enforcement program and where violations have been committed beyond any doubt, we intend to throw the book at the violator." ALPA also has opposed the use of emergency assistance personnel in Civil Air Regulations which permit the Administrator to request a pilot's assistance prior to beginning ALPA's own no penalty assistance rule against its own rule pilot is established.

According to one CAA spokesman, the emergency assistance clause is not "a new kind of investigation rule that contained exercise of pilot privileges

would create a danger to the public." He compared CAA's position to that of a "police force" and emphasized that the CAA has no judicial power whatsoever. The only possible exception he added, may lie in the power of Congress.

The provision allows the CAA to make necessary collection from violations in civil penalty cases without a hearing, although the pilot retains the right of appeal.

According to ALPA, use of emergency assistance in a judicial action. One airline pilot expressed the opinion that the CAA has the legal right to pass judgment on any one and that decision should come only from the U.S. District Court in civil action cases and from the Civil Aeronautics Board in cases of license revocation and suspension.

CAA is confident that the ad hoc committee this week will not set the record straight that exist between the two groups. William Davis, CAA administrator, who will head the CAA team of four operations experts, admitted that pilots have some legitimate complaints and will use the meeting should give pilots a proper voice in solving them.

Grand Locomotive, Pan American World Airlines pilot and first vice president of ALPA will head the pilot delegation at the meeting.

CAA Suspension

Latest rule to come to a head in the ALPA CAA head involves Capt. Leland Specht, a Trans World Airlines pilot who was suspended from duty after Specht was accused by the CAA of having an impaired attitude without proper clearance and allegedly covering a mid-air collision hazard.

Under the emergency suspension rules, the CAA (after Specht's license pending a CAB hearing on grounds that emergency of communication between the TWA pilot and New York air traffic control center, caused a mid-air collision. The CAA feels the responsibility of an airline captain should be taken from Specht until it is cleared by a CAB hearing.

ALPA promptly petitioned the action and requested an immediate hearing. The CAB has scheduled hearings to begin Wednesday.

CAA has charged Specht with a violation of federal air traffic control rules that also include off base L-Guardian. Specht, 40, was flying a TWA 747-100, based at St. Louis on Jan. 29. The TWA flight was assigned to 14,000 feet and cleared to 16,000 feet although an off-bound Captain Airlines flight was in the vicinity at 16,000 feet.

Specht called for the month to do back for emergency reasons but failed to allow controllers of the nature of the emergency. ALPA officials claim that clearance should have been granted to immediately open the declaration of the emergency and that the TWA captain was right in moving to an altitude he considered safe for his flight even though lower permission had not been granted.

The union also protested that airline pilots are now operating under open threat of detention because of inadequate training and air traffic control, airports and communications systems. CAA controls that, under such conditions, emergency measures often call for unusual measures to be taken by pilots.

Communications' Transcript

Here is a condensed version of the transcript of the radio communications between the New York ARTC air traffic controller and the TWA and Capital Airlines.

TWA New York Center, that is TWA approaching 16,000 feet.

New York Traffic above you. Are you able to WFO? (TWA answered in the negative and the controller then said he was unable to approve the change.)

TWA We're leaving 14,000 in about 10 minutes, you get him (Capital Airlines Flight 31) out of the way.

New York TWA 115, will you sit that again?

TWA I will, we are going to vacate 14,000 in 10 to 15 minutes. Please advise.

New York I am unable to approve a higher altitude on account of traffic at 16,000.

TWA Get 16,000 out of the way then. In the first place we were out of L-Guardian field ahead of that traffic and that was our requested altitude and we should have it.

New York TWA 119, change over to our company dispatcher and put me through through him.

TWA I'm not going to change now. I want to leave 14,000. I asked you to change 14,000. I want an answer by 13,000, available?

New York Negative. You have traffic at 16,000. Maintain 14,000.

TWA You get that traffic out of 16,000. I'm going up there.

New York You have a speed request for vacating 14,000?

TWA I'm going to decline on emergency. You'll better get him out of there.

New York Why are you vacating

16,000? Are you declaring an emergency?

TWA I ask you, is 14,000 a available? I want to know.

New York Yes, you can climb WFR is 15,000. It's available.

TWA Is Capital 31 maintaining 16,000?

New York TWA 115, maintain 14,000 unless you are declaring an emergency.

TWA Okay, I'm declaring an emergency and I'm leaving 14,000.

New York Roger, you have traffic above you at 16,000.

Capital Did TWA leave 14,000?

New York Capital 31, stand by.

TWA 119, have you left 14,000?

TWA TWA 119 leaving 16,000 right now.

Capital New York, we are receiving cannot at 16,000.

New York Understood TWA 119 has left your altitude.

Capital I just saw TWA come right through an altitude, off to the left. I want to know, did you do it?

Capital To TWA. Do you want to see into something? You didn't see me in any mode.

TWA What was an heading when you saw us?

Capital My heading was 306 degrees, and soon as about 240 or 275.

Push Button Transmission Added In Tacan-Vortac Data Link System

New York—First details on a data link system capable of automatically providing traffic controllers with one instant push-to-the-second information on the suspect, altitude, heading and position of aircraft under their control is well in progress. The data link system of Tacan-Vortac, which is a combination of Tacan and Vortac navigation and from special push-button installed on the aircraft, is being developed and tested by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration.

The new data link, developed by Federal Telecommunications Laboratories under Navy sponsorship, is designed to work either with Tacan or the new Tacan-compatible Vortac. The system is being developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration.

The system is being developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration.

The new data link could reduce the present need for voice communications between pilots and air traffic controllers to 30-50%, an FTL spokesman estimates.

Data Link Service

In adding \$10.18 million of data link equipment to each new Vortac or Tacan ground station, and adding an automatic data link adapter (weighing 30 lb) to present military versions, but only 14 lb in a stripped-down version could reduce the new system would make it possible to

• Integrate each equipped aircraft with the ground station, automatically obtaining (without pilot action) an instantaneous report on to airplane's speed, altitude, heading and its distance and heading from the ground station.

The data link, developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration. The system is being developed by the Federal Aviation Administration.

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altitude, speed, heading, bearing and distance from Tacan station that the airplane should take.

Several Data Links

The FTL Navy data link is only one of several related systems in various stages of development and production. USAF currently is using a General Electric developed system, known as the Airborne Data Link, in its Air Defense and Control Air Commands which provides such ground-to-air service.

Navy sponsored programs at Ball Technical Laboratories to develop a maritime data link, especially for use in the event of a ship's loss, and a new joint service program at Radio Corporation of America (AW No. 3, 1999, p. 185). The RCA-developed system, previously will be adopted by the USAF and Navy when it reaches production.

Whether the Navy intends to put the FTL system into production has not been decided.

The use of the FTL data link is that it replaces the more distance measuring equipment (DME) currently and transmitter circuits and antennas for both navigation and data link. The data link system was first developed in the concept test facility in 1943 in the Radio Technical Commission for Aeronautics was known as SC 10 report for the so-called data link communication system. All upon point by the fact that some type of data link or Air Traffic Control Signaling System (ATCSS) will be adopted soon by civil Command Services and that the FTL system will be a standard. The data link system is a standard. The data link system is a standard. The data link system is a standard.

DHC-4 Caribou Order Expected From Canada

Toronto—Canadian Air is expected to order a number of the DHC-4 Caribou to be acquired STOL result following an order placed this week by the U.S. Army for four Caribou aircraft.

The first Caribou aircraft is expected to be lost Jan. 1, 1969, and 1970 and as completion of its civil certification tests will be turned over to the Canadian Army for its own use. The first Caribou aircraft is expected to be lost Jan. 1, 1969, and 1970 and as completion of its civil certification tests will be turned over to the Canadian Army for its own use.

The new Caribou aircraft has the load carrying capacity of the DC-3. It will be able to take off and land on unpaved surfaces at rates up to 300 ft. Estimated initial cost is \$450,000 with a second, 100 ft with 10 mph headwind.

USAF Asked to Detail Cutbacks If Budget Reduced by \$1.5 Billion

By Katherine Johnson

Washington—House Appropriations Committee chief the Air Force last week what cutbacks it would make if Congress reduced its \$17.7 billion fiscal 1985 budget request by \$1.5 billion.

The committee open came as part of a package move in Congress to cut the overall \$18.1 billion fiscal 1985 defense budget between \$2 billion and \$3 billion.

The committee also requested the Army and Navy each to detail how they would apply an \$1 billion cut.

Milots Main Target

Rep. George Milos (D-Ill.), chairman of the Appropriations subcommittee on the Armed Services, said he wants to know "the areas where the services themselves would make the reductions if no more aircraft cuts, and then, evaluate the effect." He added, "We are not asking them to accelerate the reductions—although we are perfectly willing for them, if they do so to do so."

Milos said duplication in the overall program of the three services often was little field for budget cutting.

"It seems to me," he said, "there was to be some extent getting out of hand. We do not want to eliminate a project that is important to the defense of the country, but when one hears discussions about defense of this side, it is difficult setting it a table to know what to do about it."

Milos would like a Defense Department reevaluation of the overall program is already under way and could include Defense Secretary Charles E. Wilson for cooperation with his subcommittee in its efforts to reduce the defense budget.

However, Milos cautioned in a speech on the House floor that "no certain reckoning of \$1 billion from the defense request of President Reagan."

'Liberal' R&D Funds

Washington—Defense Program Review Board also volunteered to cooperate in making military reductions. It told the subcommittee that expenditures for military research and development are now "on the liberal side." In the next 12 months, he added, "I have got to make up my mind on those things, because we are going off on too many projects."

Under present plans, Milos said the outlook is that more expenditures for

conventional defense alone will reach \$1 to \$10 billion annually.

"Two programs we are working on—the intermediate range ballistic missile program and the intercontinental ballistic missile program—are in the public interest," Milos said. But since the President is regarded as a great military expert, if he could get his support and guidance we might make substantial cuts in this field, but we must proceed with great care. If (the President) could launch some heads together in the Pentagon and give us the best possible guidance.

The military-related congressional debate last week centered on whether the President or the Democratic-controlled Congress should take the initiative in proposing new reductions in the fiscal 1985 defense budget as well as other agency and department budgets.

House, by 239 to 178, voted a resolution "supportfully" requesting the President to "indicate the plans and amounts in his budget where he finds substantial reductions may best be made." The resolution does not require Senate approval. An amendment sponsored by Republican Whip Rep. Leslie Andrews of Illinois requiring the Democrats "chairman of the House Appropriations Committee (Glenn Steyer), an report on government budgets be made within three weeks to report to the House on to whose reduction can be made in the budget" was downed as not germane.

On the Senate side, a conference of Republican senators adopted a resolution requiring the Congress to reduce the federal budget "whenever possible consistent with the security of the national defense and essential functioning of the government."

News Digest

Boeing Airplane Co.'s Wichita Division will enroll Pratt & Whitney J75 engines as outboard pods on XB-52 for USAF engine test program. The J75 will each replace two J75 engines. New pods and wing modifications will be done under \$1,040,958 AMSC contract. Boeing will make shakedown flights and then turn its engined XB-52 over to USAF for the test program. Boeing is developing a J77 version of B-72 (AVP Jan. 14, p. 23).

Hawkins Inc. will develop high-temperature materials for rotating parts in

turboprop engines under Wright Air Development Center Contract. March 1 and March 3 aircraft will need bearings and gears for engine and accessory components that operate at temperatures up to 1,000°; stainless steels only.

Design studies for a chemical bomber, Weapon System 1184, will be conducted by North American Aviation and Boeing Airplane Co. USAF has awarded North American a \$3.82 million contract Boeing one for \$3.25 million.

Avco's Link automatic model made but has been adopted by the Navy for surface observation flights. Based on the Link, the model is launched from a five-inch gun and can take observations at altitudes of more than 10 miles. Instruments are obtained by balloon.

SBAC (Society of British Aircraft Contractors) believes large scale adoption of U.S. weapons is unlikely because of high cost of adapting them to British order chain system. Most high American missiles for British use than could be Nike Hercules or Titan, which, SBAC says, are not dependent on order chain for precision.

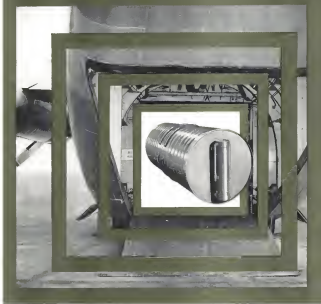
McDonnell F-101B will have first operational installation of General Electric's AS18 turbofan turbofan. Starting not dependent on ground support and weighing 46 lb. will bring engine to idling speed in 20.25 sec. GE's Aircraft Division Turbo Department is also producing a similar engine using a solid propellant instead of fuel-air mixture for B-17.

Westinghouse Electric Corp. is developing engine prototypes for a submarine capable of carrying and firing guided missiles. Company also has contract for more steam propulsion assemblies for the nuclear powered aircraft carrier.

Boeing Airplane Co. will establish manufacturing and office facilities for Boeing project in a \$21 million development center near Seattle plant. About 5000 employees are believed to be working on Boeing project.

Short Service outstanding orders were canceled by Ministry of Supply. Well advanced stage had been reached in construction of the last and last carrier based anti-submarine plane built for Royal Navy and NATO.

West Germany ordered 50 Bortol 175 ML 14 Stanoche helicopter for army, navy and air force use.



Fits into the framework of logistics



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AIR TRANSPORT

Pan American Proposes to Sell Panagra

Airline offers its interest to Braniff in new climax to long feud with W. R. Grace shipping firm.

By Rod Eastman

Washington—Longstanding feud between Pan American World Airways and W. R. Grace & Co. reached a new climax last week, with a Pan American proposal to sell Panagra to Braniff International Airways in exchange for new route privileges in South America.

Panagra is partly owned by Pan American and Grace.

A Pan American spokesman said the airline filed the proposal with the Civil Aeronautics Board in an effort to protect Grace's major shipping line from passing control of Panagra. It also followed an earlier request by Grace for Panagra route extensions that would be in competition with Pan American.

Pan American said its plan, which has been discussed by Grace, would:

- Be an end to the 30-year old feud between the two companies over Panagra.

- Meet Justice Department demands that Pan American and Grace divest themselves of their stock interests in Panagra.

- Enable the government to determine how much share, if any, the Grace Steamship interests should be permitted to retain in South American air transportation and whether Grace should be able to nominate and elect directors and officers of an airline which competes with its shipping services.

- Permit direct American flag service from the Pacific Coast of the U. S. to ports in the west coast of South America. Such a service has been provided from the Atlantic Coast of the U. S. for a number of years.

- Give the government complete latitude in establishing a sound pattern of competition between two American flag airlines in South America.

Panagra Stock Transfer

Under its proposal, Pan American would transfer its half of stock in Panagra to a government-appointed trustee and have its directors resign. The trustee would be authorized to sell the stock or pay a selling amount of Panagra to Braniff. In return, Pan American would be authorized to operate over five major South American cities now served by Panagra and monopoly rights to four cities on the eastern coast.

In 1954, J. Peter Grace, president of W. R. Grace & Co., and his company "bought an extension of carrying air service to the west coast in exchange for South American to Pan American World Airways."

Charge and Countercharge

Other charges and counter charges made by both sides:

- Pan American said Grace is seeking control of Panagra by acquiring a significant air asset that will be brought against Pan American and Grace in 1974.

- In the suit, the government demanded that both companies divest themselves of their interests in Panagra. The case has not yet come to trial.

- Grace and Pan American have been seeking to have possible means to sign the Justice Department and the CAB into a suit already underway to grip an air trade in the Western Hemisphere by going to a new route over the traditional Panagra line on the west coast of South America.

- Pan American and Grace's move to obtain Panagra's route to the U. S.—to San Francisco and New York—was an effort to regulate customs and a part of an overall plan to obtain control of Panagra.

- Grace replied that it had applied for extension of Panagra's route in order to bring the carrier to the source of most of its passengers.

- Pan American and Grace had said

that the blocked proposal for a Panagra Pan American relationship, similar to the one between South America and the west coast of the U. S.

- Grace charged that a 50-year agreement signed in 1946 between Panagra and Pan American for extension rights to the U. S. had been based on Panagra's economic circumstances.

Meanwhile, Braniff Airways President Charles E. Braniff said the airline is willing to explore the acquisition of Panagra with both Pan American and Grace.

He objected, however, to Pan American's proposal for new route extensions in South America as a condition of the sale. Braniff also opposed the Grace application for extension of Panagra's routes to New York and San Francisco on the grounds that it would involve the U. S. flag line between the U. S. and South America. Panagra lines are Pan American and Braniff.

Next Step

He added that, if the sale should go through, the CAB and White House would then discuss the matter of adjusting the means to satisfy the case before the CAB.

An earlier move, National Airlines asked the CAB to grant a March 18 deadline for filing an answer to the petition and complaint of the Grace company and Pan American's application. It is understood that it is involved in an exchange with Pan American and Panagra that permits through service from New York to Miami to South America.

Investigation for Pan American

Washington—General investigation into Pan American World Airways financial relationships with its various affiliates has been ordered by the Civil Aeronautics Board.

Purpose of the proceedings is to determine:

- Whether all agreements between Pan American and affiliates subject to the Board's jurisdiction have been filed with the Board.
- Whether such agreements are sufficiently specific to govern the proper distribution of revenues and expenses between Pan American and its affiliates.
- Whether any such agreements are adverse to the public interest or in violation of the act.

- Pan American's accounting and reporting practices with respect to transactions between the airline and affiliates.

The Board said Pan American has maintained close relationships with certain airlines and with other businesses for a number of years. These relationships have been established and maintained, the Board said, through stock holdings, revolving discount, agreements relating to financial assistance and the furnishing of services, personnel, facilities, supplies and equipment.

707 Flight Shows Passenger Appeal

By Glenn Garrison

Baltimore—An almost daily airliner is going to have tough competition for passenger appeal from the jet transport, the fact that transcontinental jet passenger flight demonstrated last week.

Along its 707 prototype from Seattle to Friendship International Airport here in 2 1/2-48 min., Boeing Airplane Co. officials indicate that the early promises of the jet age have a solid foundation.

This passenger, departing at 10:45 a.m. from Flight 707-1, feels it is going to be different from the airlines' others after a time of the turbine age.

The newsmen's speed took off from Runway growing 191,557 lb., including 11,577 lb. of fuel, it landed at Baltimore with 25,000 lb. of fuel left, enough for two and a half hours of flight. The pilot, and 40 crew, and 5,280 ft. of runway to take the jet into its scheduled 11:06 ft. in 16 min. and flew 7,535 statute miles at an average ground speed of 652 mph.

Leading Length

Spoken to transatlantic time was 7 1/2-56 min. The plane used 6,000 ft. of Friendship's 9,450-ft. runway for its landing.

Highest ground speed of the flight and of the 707 at any time—some 695 mph—was good during a head-on encounter with a jet stream.

Johnston qualified into the jet stream near Spokane, and the record ground speed was reached between Seattle, Penn., Md., and Lexington, Mass. This component at one point was 124 mph in ground speed, although the jet stream's velocity was greater than that. The transatlantic jet stream was less around Lexington, and ground speed dropped off to 520 mph between Lexington and Miles City, Mont.

The lowest-altitude jet at 11,000 ft. about an hour from Baltimore, and climbed to 15,000 to avoid turbulence. New York's Air Traffic Control directed the 707 down to 20,000 because of "jet stream" a high flying B-52 being the 707's outland and ground.

Fast consumption during the high speed cruise at 11,000 ft. was about 15,000 lb./hr. The water injection repressured engines, were running at about 90% of maximum RPM, and the engine and declining about 95% of maximum available thrust. True air speed at 11,000 averaged 595 kt., Mach .86.

Shorter cruise settings for transatlantic routes would be about 7,000 lb./hr.

be at the same altitude, and provide about 75% of maximum thrust.

Johnston led down from 25,000 ft. at the size of 15,000 lbs., back off to 3,000 ft. at an altitude of 11,000 ft. His, however, was made with upland out, gas down, and port flap. The 707 was including 190 kt. on base leg 120 kt. on final. Johnston added power to the engines back before touchdown.

Cuba was powered to equal 6,500 ft. for the trip. Letdown for regular airline operations would be considerably shorter—about 5,000 ft. second was to the pilots.

Blended time of the transatlantic flight has been bettered previously in a B-47 and a Navy F-101 fighter. The bomber made it in 7 1/2-47 min., the fighter in 7 1/2-45 min. Neither carried passengers, and the fighter has a cruise 100 mi. shorter than the 707's.

The airplane was tested in contact with Boeing's ground VIF radio for about 150 ft. in addition to Civil Aeronautics Administration VIF for the test of the trip. Communications and DME were used for navigation, the latter a CAA hardware Corp. developed test set. The plane ran over Baltimore runway in 1954 Pacific Time.

Boeing set the flight up in airline style complete with belts and bag tags checks. Aircraft's interior was divided in partitions into three passenger compartments and a cockpit. Forward compartment was equipped with 14 seats, a long working table on the left side, a smaller table between two groups of seats on the right. Second compartment, separated also by the improved galleys and test equipment, was fitted with 16 seats abreast. It was a standard airline outfit, except that the partitions were, with coffee, blue and white. After noon, however, the finished from the first two held 20 seats.

Three transatlantic, Becker Gilman of Boeing, in Air Routes of TWA and Sherer Adams of American, were test in addition for the trip. They saw an elaborate night landscape from galleys equipped with test in Pan American and Western Union Seattle-Tacoma airport.

Compartments Quieter

The 707, which has been known for its quietness, was quieter than a private airplane. But passengers, except the aft end, was not certainly no quieter than there is a private airplane. In airline service, however, jet passengers will be seated first because of the quiet character of the jet. Transatlantic will be longer "jet there first"

to first do in same context configurations.

The airplane is too narrow for comfortable first-class seating, but the production 707-121 will make more 15 seats wider in width than the prototype to allow a higher density.

Test Equipment

Flight 707-1 also carried a variety of test equipment. This included a big "A" panel in the forward compartment for distribution of all electrical gathered data, a 35 mm. movie camera to record instrument readings on a tape, and a tape recorder, airspeed, altitudes, loadings, etc. It also carried temperature indicators to log engine performance data for the engine.

In addition to the 42 passengers-on test equipment, airspeed and altitude, the 707 carried 10 Boeing personnel including pilot J. R. Conner and S. L. Walker and flight engineer J. K. Longmire.

The flight was so smooth that its passengers were standing erect and some as well in the forward compartment and shooting pictures of their airline passengers will find the same time spent in the jet of the current business and the available nature before existing time making this have experienced in today's operation.

Supersonic Search

It was plain to see that still longer than the jet, at least for long haul traffic, still provide against current aircraft.

What about the problem of supersonic noise—the headache that has led the Part of New York Authority to ban jets from airports in the New York area?

Boeing says it has spent more than a million dollars in its field on a supersonic, which will be combined with a thrust booster. But as the Boeing hasn't increased the possibilities from a single engine to a twin engine.

Boeing is to have a test flight thing in July. Probable point in early at zero noise level condition can be below 3-4B, Boeing says.

But this is hope, and is of little use to those who are the problem as yet to exist. Looking to the big jet, even short its engines of Boeing's test set and takeoff as a test flight before the cost-to-cost, the jet's noise problem is still a problem.

There are indications that the noise, if necessary, simply will be lived with. The ground crew now near Helsinki and perhaps some other locations may be required in the second year. But the jet is here and airports will probably adapt to it even in its present



707 WITH SUPPLEMENT is shown in flight during test. Devote is attached to left outboard engine. Boeing hasn't settled on first design of some supplement for the jet transport, hopes to have out flying by fall. It would be combined with a thrust booster. Second test transatlantic passenger flight was made without altimeter.

area if they have little alternative.

A group of airport operators—including top staff of New York Authority—agreed to restrict to Boeing a few days before the post flight for testing on the place.

Boeing let the operators have the 707's terminal equipment and provided them with data on the engine work. The New York Authority wasn't so much, and Transatlantic Director Austin Tolson made a statement normally refusing his agency's test. The position that Boeing was to test some other operators would accept the jet even

members San Francisco according to the authorities, has requested a visit to the jet, however, Adm. John C. Calverley, director of Baltimore's airport of aviation, told American Western that the 707 looked at Friendship that he can probably would accept

substantially jets in regular service operation. If, however, authority declined, Calverley said the jets would be taken out again.

Baltimore's Experience

Baltimore has had no substantive comments, reaction from airlines, jet operators at Friendship the official said. He pointed out that Friendship's approach into intention was a lot better than New York's.

The 707 was assigned to Gate B-6 at the end of Pax II on Friendship's ramp, Calverley said, because that area is planned for handling of two jet transport. The planes could park there, one on each side, and turn out without touching other planes with their jet blast, he said.

With water injection, the prototype 707-1 and Whitney J57 engines develop 10,200 lb. thrust. The 707, the 707, is 9,330 ft. First production 123 models will be used at 11,000 ft., 13,400 ft.

Of the non-turbine characteristics of the 707, Johnston says that pilots will only begin to experience how loaded the prototype. One non-turbine pilot who has landed 707, Johnston says, a CAA Administrator J. T. Pyle.

Johnston also says the airplane can hold at 33,000 ft. with very little range penalty.

Reason for holding back, the pilot points out, is not so much that item attitudes are not so much while holding back, but that climbing back from a lower altitude to go to an altitude is only so fast.

The jet's engines are to be tested with an auxiliary electric start, or with a jet engine starting system. The latter is a need for one engine, with the other three then started in sequence bleed from the first engine. Johnston says the J57 can go from idle rpm, to maximum thrust in 10 to 15 sec., at a speed he calls as good or better than present jet engines. Further, he says it's impossible for a pilot to damage the engines in passing them on or cutting them off.

Boeing's thrust engine will be designed for use on the ground too only. With the 707's sports system the device won't be needed for approach. The engine will be used and not start a set low speed, probably 110-130 mph.

As for production, the Boeing of Pan American's first 707 is now taking shape at the Boeing Co. in Everett, Wash. The 707's average ground speed was 592 mph.

Boeing says, production of 707's and KC-135's will reach about 30 a month, with two-thirds of them tankers.

Mockup Fleet

Boeing is building a sizable mockup fleet in connection with its 707 production. Two full-length models are in the plant, one equipped with wing, instrument and the like for technical work, the other for use in actual instruction. Five 60-foot cabin mockups have been built and more are planned for individual airline use in developing their interior layouts.

A complete order is about to be placed that the smaller mockups are key sections, looked up so that no airline can miss a part, at what number is doing with its aircraft.

A flight mockup also is on display in New York.

On its return from Baltimore, the prototype was scheduled to fly to Andrews Air Force Base (its alternate to the coast-to-coast trip) and back, then go on to visit Chicago and Denver. The 707 personnel had visited the command Los Angeles International Airport and Seattle Tacoma Airport several times over, in addition to military fields.

On its October, 1955, Seattle Airlines' first 707's average ground speed was 592 mph.

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AMERICAN AIRLINES
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due to land with a minimum of re-equipment. Replacement engines move by ship, a slow procedure. Airlines are sent to bases in Europe for repairs.

Saudi Arabian Airlines needs better organization as a company separate from the government, Sherrill says. But "you do it's going to be the best airline in the area."

Ethiopian Loss

Ethiopian Airlines, which recently suffered a \$34 million loss from the Texpert hijack, Bank of Washington for fleet expansion and airport expansion report (AW Jan. 28, p. 57), is operated and managed by TWA under a Civil Aeronautics Board-approved contract with the Imperial Government of Ethiopia. TWA set up the airline for Hialeh Scherer in 1945, now has 31 personnel working for it, of which 20 are pilots.

Thus World gets a lot for its investment of the Ethiopian carrier. Airlines business in and out of Ethiopia is substantial—Sherrill estimates it totals \$1 million a year. Ethiopian Airlines contracts with major international carriers, including TWA, at Cairo and Addis. It suspended service to Cairo for some time following the Sept. 11 crash but recently resumed service to the Egyptian port.

In January, TWA signed a contract through ICA to set up an executive three-year training program for Ethiopian Airlines pilots, maintenance employees and a supervisory staff. Contract was for the amount of \$775,000, and the Ethiopian government will match the U. S. money with counterpart funds. The Ethiopian funds will go into training places, fuel tanks, school buildings and clerical help.

The American carrier has been training Ethiopian personnel all along on a somewhat smaller scale. Co-pilots are Ethiopians, and the first Ethiopian captain—Alexander Shale—was commissioned this year.

Developing the Ethiopian airline has meant overcoming tough operational problems in the rugged country, much of which is situated on a plateau with an average elevation of 9,500 feet. TWA board chairman Warren Lee Paxon, in announcing the training contract, said of Ethiopia: "That airline steadily tapered from the age of the boat to border to the age of flight. Today the airplane is the only stable means of communication between Addis Ababa and the outside world."

Ethiopian Airlines now serves 22 cities domestically, flew 67,800 passengers since 50,615,800 miles in 1951 and carried about \$300,000 that year.

TWA's Victor II Harrell Jr. is EAA's general manager. He says: "How does TWA deal with some pilots and mechanics for assignment to other airlines overseas? Partly by assignment directly for the pilot. More than half of the pilots provided Saudi Arabia, for example, were not on TWA payroll before being hired for the job."

Standards for such pilots, Sherrill says, are high but not necessarily as high as would be required for direct TWA duties. Also, despite the living conditions, employment in countries like Saudi Arabia is attractive in some respects, particularly in the chance it provides to save money. And there is a serious clause about the assignment, which is made under a one and a half year contract.

TWA's participation in the operations of some foreign airlines involves having joint fleets. The airline owns 40% of Lufthansa Airlines, for example. TWA serves with an ex-lease capacity, according to Sherrill, and even often serves only if asked. In fact, TWA would not be seen just at Lufthansa airports, Sherrill says: "We'd be glad to go south, but we'd prefer to take our own carrier with us when we go."

TWA also acquired stock in the Greek airline, TAP, now under control of American Overseas Travel World. It provided pilot and maintenance help in the airline for a period, even 10% of its stock, which Sherrill describes as primarily "worthless."

TWA has been holding discussions with Ghana, Sherrill said, and "if we can work out a suitable arrangement, we'll be glad to help them back."

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on their feet." The TWA official believes the Greek carrier could do well, for example in handling truckers' dollars among the lowest fares in the area.

TWA reported some stock in Iran and Australia when it provided pilot training for a period just after the war, but no longer owns any part of that carrier. Another past ownership is held in Philippine Air Lines, which TWA helped in its international operations with names and personnel. PAL has suspended its international services for the time being, however.

The American carrier has entered into short-term agreements with other countries for TWA technical assistance in airline operations. West Germany, for example, contracted with TWA for captain to fly Lufthansa's transatlantic route. Eleven of the TWA pilots are now flying with Lufthansa, and a new contract is now being negotiated which will run to mid-1953. In fact, Sherrill said, TWA will be in short of men to fly its own overseas routes that the airline hopes Lufthansa will take over on its own.

The German airline plans the TWA pilots' salaries, plus an additional percentage, for the period service. But this also is about a break even deal for TWA, Sherrill says.

Of TWA's customer programs in a whole, Sherrill says the airline's approach is not to make money through such contracts. "We're in the business of flying," the official points out, and what helps matters here TWA's programs also serve the interests of the U. S. government.

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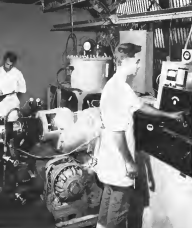
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New Super-Broussard

Drawing of Max Holste Super-Broussard shows 1417 passenger aircraft designed for maximum speed of 730 mph. Powerplants are two Pratt & Whitney K1440 engines developing 580 hp. each. Broussard's maximum cruising speed is 500 mph. It is 75 ft. long, weighs 6.5 tons, empty weight 4.5 tons, and ranges about 1,500 mi. 1416, engine of performance Broussard five passenger liaison model has been delivered.



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Mexican Pact Sets Stage for Route Battle

Washington—Signing of the first bilateral Air Transport Agreement between the U.S. and Mexico has focused all a flurry of activity that probably will result in better coordinated traffic for U.S. airlines for two of the seven routes involved. General laws have designated for the other five.

The agreement involves the two countries after four years of negotiations calls for more routes for U.S. airlines between the U.S. and Mexico with reciprocal routes for Mexican airlines.

It also stipulates that, for the present, neither country will designate more than two carriers to fly each route, although all routes may be given new status at the carrier's discretion. Effect date of the agreement is June 5. It will remain in effect until June 1959.

Route Structure

Routes agreed upon are:

- New York, Washington-Mexico City
- Chicago, Dallas, San Antonio-Mexico City, via intermediate points in the U.S.
- Los Angeles-Mexico City, via intermediate points in the U.S.
- New Orleans-Mexico City, to Guatemala and beyond.
- Miami-Mexico City and beyond, to Costa Rica and beyond.
- Houston, Brownsville-Tampico, Mexico City, Tapachula and beyond, to Guatemala and beyond.

Under the agreement, Mexican airlines can serve the same points under the same authorizations via intermediate points in Mexico except in the case of the Houston-Guatemala route which was left pending.

The State Department says the short term of the agreement will give both countries an opportunity to observe the principles in operation and recommend changes or modifications that may lead to a longer and more lasting agreement between the U.S. and Mexico.

Conversations concerning subsequent negotiation of an air transport between the two can be initiated at the expiration of either governmental prior to May 30, 1959.

Immediately after the announcement of the signing, President Eisenhower dispatched Goodwin to the status of three countries awarded in 1946 and five created by President Truman in 1952 because they were not invited due to lack of air transport between the U.S. and Mexico. He had been advised by Attorney General Brownell in 1951 that Truman's action, marking the territories ruled by Benito, Hitler and Western nations to strike Mexico did not comply with



MAP shows areas U.S. Mexico routes agreed to in first bilateral between the countries.

territory procedures provided by Congress and that, therefore, he would recognize the validity of the territories.

This move opened the way for Western Air Lines to begin service between Los Angeles and Mexico City, Eastern Air Lines between New Orleans and Mexico City upon the effective date of the agreement. The same opinion, however, clouded the issue of designating an airline for service between Chicago, Dallas, San Antonio and Mexico City.

American Routes

American Airlines in 1946 was granted a certificate to serve Dallas, San Antonio and Mexico City and obtained authority from Mexico to operate the route because of this certification was not canceled in 1952.

American also operates between Chicago and Dallas and other air-planes serve from Chicago to Mexico City. Brownell in 1946 was granted a certificate to operate between Los Angeles, San Antonio and Mexico City, but under its domestic authority, it also serves Dallas and Chicago. Neither Los Angeles, at present to fly Chicago-Mexico City route.

Since the agreement stipulates that not more than one U.S. carrier will be designated to fly over each route, one of the routes could be granted operating authority at that time.

Last week, Brownell president Charles E. Brownell said the Civil Aeronautics

Board and Department of State to designate Brownell as the operator of the route between Chicago, Dallas, San Antonio and Mexico City on the basis that it is already certificated to serve the route.

The CAB indicated that the designation of an airline for the route will be decided through Board hearings on applications by airlines to fly Chicago-Mexico City route, in which case service to all points along the route probably would be consolidated. The proceedings would not necessarily be limited to American and Brownell.

American Airlines said it already has an application for such authority, pending before the CAB that was filed in 1947 and indicated it will request the Board to set the application down for an immediate hearing.

New York-Mexico City

The only other route in which designation of a U.S. carrier is in doubt is the one between New York, Washington and Mexico City. Proceedings were begun in 1949 but have been progressing slowly up to this point. However, the Board said the action will be accelerated and an effort made to complete the case by June 5.

Involving the application of Eastern, Pan American and American Airlines for authority to fly to Mexico City from both New York and Washington. President said the Executive decision, and agreement, the

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New York — Paris	11/2/57	9 hours 18 min.
New York — Vientiane	1/22/57	11 hours 26 min.
Shannon — Chicago	11/24/56	9 hours 21 min.

As long ago as 1935, Pan American indicated to the aircraft manufacturing industry the need for an airliner with a range great enough to make ocean crossings a truly expeditious service. Seventeen years later, in 1952, the Douglas Aircraft Company, fulfilled this need with the "Super-Tw." And Pan American, last June, was first to introduce the DC-7C into service.

When Pan Am started flying the "Super-Tw" on the North Atlantic, it solved a problem that defied the aviation industry for years: namely, the need for an aircraft able to fly the Atlantic nonstop—in other words—under all weather conditions.

It is the world's fastest over-ocean airliner. And it is also superbly quiet and vibration-free. Triple-thick windows, improved soundproofing and the fact that the engines are mounted five feet farther away from the cabin make the "Super-Tw" a new experience as flying unfolds.

More important, however, is the over-all effect that the DC-7C will have on nations. Because as the world awakes to star, and as more people travel every year, there comes a gradual breaking down of boundaries. And it is no secret that as boundaries are removed, so are international business. It is with this hope that Pan American looks to the future.

The first responsibility of an airline is to be a useful citizen.

PAN AMERICAN WORLD AIRWAYS

*Feeding pre-heated fuel
to Air Force "Heavyweight"*

**SOUTH WIND FURNISHES
OIL-TO-FUEL HEAT EXCHANGER
FOR LOCKHEED "HERCULES"**

On Lockheed's C-5B "Hercules," as on all turbine-powered aircraft, the correct solution of heating and cooling problems is essential to success. South Wind's 880-A, designed for the C-5B, helps solve these problems by pre-heating jet fuel and by being in cool engine oil.

Fuel flows through the 880-A where hot engine oil heats it to the optimum temperature for efficient combustion. The amount of oil passing through the exchanger, hence the amount of heat transferred, is controlled by valves sensitive to fuel temperature and oil pressure. The balance of the oil is diverted through a by-pass.

The optimum range of fuel temperature is narrow, the least of engine oil is expensive. These factors require the finest in engineering skill, materials, and production techniques for solving the problem. To avoid yourself of such a task, write to South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.



**South Wind Model 880-A
Oil-to-Fuel Heat Exchanger**

Standardized tube bundle utilizes 280 die-cast tubes in staggered arrangement. Exchanger controls pressure and temperature sensitive control valves. Minimal weight, 12 lbs. dry. Number of Fuel pumps: hot fluid only, 2; oil fuel side, 4.

South Wind

HEAT EXCHANGER EQUIPMENT
AIRCRAFT HEATING
HEAT GAS GENERATORS



Board's recommendations and, finally, the President's approval.

The remaining three routes, New Orleans, Miami to Guatemala and beyond, Miami-Mexico to Guatemala and beyond and Houston, Brownsville, Tampico, Mexico City, Tapachula to Guatemala and beyond, are now operated by Pan American. The airline is under which it operates is the same as outlined in the agreement denoting the routes. These routes were also awarded in 1946 and apparently from Mexico to operate were obtained.

At present only two Mexican cities may operate between Mexico and the U.S.—Guatemala, Mexico de Atacama serves the Mexico City-Los Angeles market and Costa Atacama Mexico serves the Mexico City-Miami market.

SHORTLINES

► **Skid Airlines** flew 4,294,542 enroute last month, a gain of 47% over February, 1956. Load factor for the month was 64%. Skid also flew 248,361 revenue charter and contract miles in February, also a 47% increase.

► **Meteor Air Transport** gained \$2,714, 735 last year, an 87% increase over 1955. Net 1956 operating income of the contract carrier was \$1,151,584, compared with \$52,530 in 1955.

► **United Air Lines** has started non-stop Washington-New York service under new authority to operate between Boston and Washington. Baltimore was an intermediate point. Airline also has started non-stop DC-7B service between Los Angeles and Detroit.

► **Isleair Belgium World Airlines** is offering service over package, in competition with the Hellen Line. Routes can include 5-15 helicopter destinations between destinations Paris and Brussels.

► **Airlines clearing losses handled** \$61, 861,991 in airline business during January, up from \$53,821,911 in January 1955.

► **Boeing International Airlines** has notified RCA member under its authorization to fly DC-7Cs. Boeing is the sixth major U.S. carrier to buy the RCA equipment.

► **Passenger** on cargo carriage rose 51% last year to 1,966,000 revenue ton-miles. The airline added two all-cargo DC-4s to its fleet during 1956.

► **Caribbean Airlines**, Southern California air transport, added two T-12 Severs 9 1/2 four-engine transports for passenger/cargo service.

AIRLINE OBSERVER

► **British** is preparing a route analysis of Britannia operations for National Airlines. According to British Managing Director Peter Mansfield, United Air Lines and American Airlines are showing an interest in the forthcoming transport. Mansfield has been in North America with test crews who have been conducting cold weather flights in Northern Canada with the first production model of the Britannia 182. Test flight from Vancouver to Miami was successful following an engine change in San Francisco because of engine rob. Spare engine was flown in from England so that the change could be made.

► **Pan American World Airways** has filed a suit with the Civil Aeronautics Board that would grant its passengers to travel between Chicago's Midway Airport and O'Hare Field via Chicago Helicopter Airways free of charge when making connections with domestic flights. If approved, the suit will begin April 1, with Pan American paying the cost of the shuttle service for the passenger.

► **Second Caravelle** prototype will begin 41 North and South American routes on April 10 following public demonstration flights for civil and military officials in Rome during the latter part of March. Flight test programs have been completed and the aircraft is now being modified for passenger service. Flights will be resumed. Configuration calls for 52 seats in 13 rows of four seats each. Carpeting is green and brocade portairage will decorate the window linings. The aircraft's special characteristics of the aircraft, Maestri's answer will be played out headquarters located at each row of seats and as seats.

► **Scandinavian Airlines System** is developing a new navigation system based on radio navigation. The airline believes the new system will be particularly effective in polar regions and will produce a high order of accuracy in other areas as well.

► **Greater Los Angeles** will post 21 more Metropolitan 440 transports to bring the total sold to 140, of which 70 have been delivered. Latest sales include five to Entom Airline, three to United Cal Co. of California and the balance to seven foreign airlines.

► **Trans-Atlantic Airlines** is planning to order the Caravelle jet transport as an eventual replacement of its Viking Vikings. Decision to order the Caravelle will be reached by the American government which is under French pressure to increase imports from France as a means of equalizing present balance of trade.

► **United Air Lines** will have an operating fleet of 280 aircraft by the end of 1957. Present fleet totals 175 aircraft with 11 DC-4s and 24 DC-7s scheduled for delivery this year. Planned fleet of seven DC-4s will be added this year, although one can be ordered for testing purposes. The airline is forecasting an 8 to 12% increase in revenue passenger-miles during 1957.

► **E. S. South Aircraft Corp.** is investigating the possibility of producing the CW-207, transport version of the C-46. Cost will be the prime factor in the decision on the production program. The Miami sales and marketing company has delivered 12 CW-207s, holds orders for an additional 14, mostly from foreign airlines. It currently produces 25 C-46s from the Navy for conversion to the CW-207 configuration.

► **Post Office Department** will intensify its congressional campaign for a raise in postal rates, including an increase on air mail letters from 10 to 12 cents per ounce and from five to five cents on air mail books (AW Feb. 18, p. 49). The increase would yield an additional \$17.7 million annually. Post Office also is urging passage of a bill that would repeal the Kelly Act of 1930 and reimburse the department a total of \$2.6 million for certain public services it performs. Included would be \$2.6 million paid by the Post Office for the transportation of U.S. mail by foreign airlines at a Universal Postal Rate in excess of the rate provided by U.S. carriers.

What does it do between

HERE and...

THERE?

For the first time the behavior pattern of a free space Moving Target can be directly calibrated and immediately evaluated!

The proof of any guided missile is its performance. Not only is it necessary to provide accurate trajectory data in order to determine its effectiveness, but this must be made immediately available.

To meet both requirements is the purpose of the AN/FPS-16 instrumentation radar. This is the first radar developed specifically for Range Instrumentation. It has demonstrated its

ability to track with accuracy in darkness, through clouds—under any atmospheric conditions—over extended ranges, and to yield data that can be reduced almost instantaneously to final form. This unit can also be assigned to plot performance of missiles, satellites, drone and other free space moving targets.

In the past, this data has depended upon

optical devices, triangulation systems with long base lines and precision instrumentation, modified radar equipment and data reduction methods often requiring months for computation. The immediate availability of data evaluation provided by the AN/FPS-16, now being built by RCA under contract of the Navy Bureau of Aeronautics for all services, is a great forward step in Range Instrumentation.



Defense Electronic Products
RADIO CORPORATION OF AMERICA
Cleveland, N. J.

Slick, in Black, Sees Brighter Future

By Craig Lewis

Dallas—Last year Slick Airways produced its first profit since the merger with the Flying Tiger left the group. The cargo airline looks to 1957 as a year of expansion throughout its diverse pattern of operations.

Slick, except a profit of about 50 cents a share on its 845,000 shares of common stock in 1956, an encouraging extension from the previous year when the airline incurred a \$155,157 loss. Total losses nearly doubled in 1956 to \$221,400.

Traffic has been running at a 64% load factor in the early months of 1957, and February showed a 45% gain over traffic in the previous February. Slick expects further substantial gains during the year.

Interest Costs

The cargo carrier expects revenues to continue to climb this year, although high interest costs for equipment loans will probably keep profits at the 1956 level. Slick doesn't expect to be able to pay a dividend until 1959 when debt obligations will slack off, possibly freeing cash for dividends.

Slick expects revenue increases this year in each of these three areas:

- **Container** carrier services over its scheduled cargo air routes
- **Contract and charter work** for both civil and military customers.
- **Overhaul** work on engines for Air Force transport.

Slick's president, Robert J. Smith, says his airline's 1956 gains primarily in the increase in lift capacity provided by the acquisition of the DC-4 and two DC-6As during the year. He feels that the increase in DC-6A capacity was especially important because of the increased long-haul characteristics of the Douglas cargo transporter.

Another factor cited by Smith was the increased acceptance of container carrier airfreight service by shippers. Along with this improvement in the revenue carrier situation, Slick's charter and contract work increased substantially during the year.

Shopper Acceptance

Smith believes that the improvement in shopper acceptance of airfreight will contribute to the growth both of Slick and of the airfreight industry in general this year. Slick's president feels that demand in the use of airfreight is moving into industry's policy level, where the service can be considered as an overall package.

This policy consideration of airfreight



DC-6A figures importantly in Slick's operations because it is an economical long-haul plane.



SKY VAN freights moving service is expected to become big source of future work.



LARGE FREIGHT TRUCKS, a need for airfreighters, expedite loading directly from truck.

AVIATION WEEK, March 18, 1957

U. S. TIME GYROS IN CONTROL

The development and production of sub-miniature precision gyroscope type instruments are exacting problems. These problems can only be solved by combining the skills of creative, measured research development and production engineers within the framework of an organization long experienced in the problems of precision instrumentation.

Important example of U. S. Time's present role in the gyroscope field has been the volume production of sub-miniature precision rate gyros. More than seven thousand of these precision-built rate gyros are currently being used in guided missiles, antenna stabilization systems, autopilots, bumper systems and stable platforms. The performance characteristics of these rate gyros can be modified to suit your specific requirements.

U. S. Time's new enlarged research staff and facilities are engaged in research, design and development of sensitive precision instruments—struments to withstand and perform under the severe environment of aerospace aircraft and missile flight.

We can be required in the following fields of precision instrumentation:

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Another transportation system Slack is developing to provide more cargo traffic in the truck-entirety program that project involves closely knit operation between Slack and trucking companies operating around its terminals. The truck lines would drive to feed cargo into the carrier's terminals for rapid transfer and shipment by air.



Second Viscount for Hong Kong Airways

Second of two Viscounts ordered by Hong Kong Airways is test flown in Britain. First air craft has been delivered and is making periodic flights. Viscount carries deeper tanks, which Hong Kong Airways was the first to specify in order for the transport.

more the shipper will weigh all its advantages in his domain rather than riding strictly on comparison of direct costs. Thus savings a shipper can make through reduced inventories and other means become apparent and help tip the scales in favor of airfreight, according to Smith.

Slack expects its container carrier line to make substantial gains in 1957, but Smith cautions that scheduled air cargo operations have not yet reached the peak where an airline can make a profit on them alone. The blowy then is the lack of a cargo transport with operating rates which are below the general level of rates charged for carrying cargo.

Meanwhile, Slack began experimenting with a system of moving household goods by air in a series of processing more cargo traffic. That's the Van system only for packing household goods in large aluminum containers which are then loaded to the airport, flown to destination and trucked to the home for unloading.

Cargo Offer

Slack Van costs \$1 to \$2 per cwt more than surface transportation, but Slack points out that the faster delivery by air saves a moving household item in large aluminum containers, insured while waiting in a land for the transporter to arrive. The airline believes that the large number of business transfers now common in U. S. industry makes the faster look good for Slack Van.

Another transportation system Slack is developing to provide more cargo traffic in the truck-entirety program that project involves closely knit operation between Slack and trucking companies operating around its terminals. The truck lines would drive to feed cargo into the carrier's terminals for rapid transfer and shipment by air.

Slack believes that the truck-air sys-

tem would reduce the use of air transport for freight movement by increasing more flexibility with the transportation network, by eliminating the need for storage and by making shipping simpler through the use of a single vehicle.

Slack's charter and contract work is becoming an increasingly important segment of total operations. A separate division has been set up to handle this business, and currently it is producing 60 to 75 cents of revenue for every dollar of container revenue earned.

Most of the civil charter business is across the North Atlantic, flying groups headed for vacations in Europe. From the increased number of inquiries as for this year, Slack expects its charter business to grow substantially in 1957.

Military Contracts

Another facet of the business is the military contract work conducted by the carrier. Slack is currently flying military personnel and dependents across the Atlantic under an Air Force contract that runs until June 56. The carrier also has a number of Atlantic flights scheduled for the Interagency Coordinated Committee for European Migration this spring.

Slack's U. S. three enterprises as the Ford has operations at San Antonio. The San Antonio facility, which produces about 35 cents in revenue for every container carrier revenue dollar, overhauled the B-100 engines for the Air Force T-35 trainers.

The San Antonio base has been the Air Force's sole overhaul center for the B-100 since 1951. The current contract runs until June 56 with options for renewal. Slack is planning the plant into the jet engine overhaul business by starting with recovery overhaul.

Slack's profitable 1956 marks a decided change from the low ebb the carrier's fortunes reached late in 1954



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We machine to ✓

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Save your pilots and aircraft by

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A test carried out with the Safeland Air Force jet follows 129.

A test carried out with the Safeland Air Force jet follows 129.

Weight of aircraft 11,000 lb (5,000 kg)
Cruising speed 90 m/s (170 km/h)
Braking distance 390 ft (120 m)



After purchasing their second Air Force have already ordered the Safeland aircraft net, for instance, Sweden, Switzerland, Denmark, Italy, France.

An aircraft equipped for aircraft of 61,000 lb weight and cruising speeds of 125 m/s per hour are made featured.



One of the twenty tests carried out with the Swiss Air Force Vampires.

Designers: Royal Swedish Air Board

Sole manufacturer:

BEFAB

Borgs Fabriks AB
Norrköping, Sweden



This diagram shows the braking distance of an aircraft with a braking effect of 4 m/s each brake.

The safety net BEFAB "SAFELAND" embodies, among others, the following advantages:

1. Safeland the aircraft which enters the net automatically its engine, gliding, ground loop etc.
2. Causes little or no damage to the aircraft.
3. Simple to erect.
4. Easy to move about.
5. No extra down force on runway.
6. Very low installation costs.
7. The total weight of the equipment about 5,000 lb.



Ju-52 Stays in Service

Twelve Ju 52 transport transport Luftwaffe's charter in the 1950s, it joined at Bielefeld airport with new Luftwaffe Super Constellation Ju 52 is one of two bought by New German Airlines from England and re-equipped with Pratt and Whitney 600 hp engines.

when a merger with the Flying Tiger Line left through. The two airlines were actually operating on a combined basis when later problems made them decide to abandon the merger.

Through 1955, Slack concentrated on acquiring capital to add to the 10 G-4s and two DC-6As it had after the merger failed. The company also had to rebuild its entire organization and establish itself in the cargo market. During this period, Slack was run by his board chairman, Duke W. Rasmussen, and executive vice president, Gordon W. Rasmussen, who resigned a year ago.

to go with Northwest Airlines.

The airline ended 1955 with a \$533,357 net loss, but most of it was concentrated in the first half of the year, and after followed a sharp improvement all through the year. Gross continued through 1956 with the mailing improvement in the profit picture.

During 1956, Slack's operations were reorganized, and several new ones were brought in at top management levels. Operations were assigned under three vice presidents—John E. Mulholland, sales; Henry F. Hoff, Jr. for services; and Alvin W. Johnson for financial affairs.

Leading the management changes was the appointment of Robert L. Smith as president in May, 1956. Smith had been president of Pioneer Air Lines from 1946 until the merger with Continental Air Lines, and he heads Pioneer Aeronautical Services, the corporation that took over Pioneer's Martin 2-0-2s. He has had experience with American Airlines, Braniff Airways and the Air Transport Company, and he is currently chairman of the Eleventh Federal Reserve Bank.

Slack completed a shift of its headquarters from Burbank to Dallas early

NEW MODEL 21 AMERICAN MECHANICAL INERTIA REEL HAS WIDE ANGLE OF INERTIA RESPONSE

An entirely new shoulder-harness take-up reel, built and approved under Spec. MIL-B-6236, Type MA-1.



1. Has extremely wide angle of inertia response. Reel throughout range of constant speed known as only by higher priced model mechanical type reel.
2. Can be locked either by inertia or manually, or extended at low cable extension.
3. New Inertia Reel Mechanism provides positive locking, dual cable retraction action.
4. When not in locked either by inertia or manually, with harness cable extended the harness cable will retract into the reel when hand is released from cable.
5. Angle of retraction, with respect to horizontal axis of aircraft, is not critical.
6. Thinner, 100"-115" overall. Max. reel overall and control cable only 10" dia.
7. Manual control requires no adjustment. In case of difficulty, positive push pull control cable provides EASY manual operation when used on adjustable seat.
8. Uses same maintenance loading as other reels of our manufacture.
9. Fully approved. Manual control control cable of reel can easily be replaced without changing other components. Harness cable is reel can be replaced easily by 100% personnel.
10. Available in 100" or your desired length.





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We also make Uniflexion Reels conforming to Spec. AN-R-20, Amendment 2, and Multidirectional Reels per Spec. MIL-B-6236, Type MA-2, Type MA-3 also available soon. Write for full details today.

emergency seal regulator



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What's special about these pneumatic controls?

Janitrol's aircraft pneumatic controls are special because each new control has a backlog of successful, service-proved designs behind it. Many designs incorporate multiple functions in one integrated package—actuators, pressure regulation, and air control. Invariably the "package" weighs less, takes up less room than separate controls. Choose from service-proved designs or set your own specifications.

Three of many different types in service: 1. Canopy seal regulator: actuates mechanically by canopy movement—maintains pressure at inflated seal, but releases instantly for emergency escape. Auxiliary port provided for other uses. 2. Pylon tank regulator with relief valve, maintains constant pressure for fuel transfer. 3. High pressure anti-icing valve, regulates jet engine bleed air pressure for use in anti-icing systems.

Janitrol's pneumatic controls are an outgrowth of long engineering and manufacturing experience in aviation air handling and fuel transfer equipment.

Janitrol Aircraft-Automatic Division, Surface Corporation Corporation, Columbus 16, Ohio . . . District Engineering Offices: Washington, D. C., Philadelphia, Columbus, Ft. Worth, Hollywood.

REGULATORS, VALVES, SEAL, EXHAUSTERS, PRESSURE CONTROLS



due soon. Smith sees the carrier made the move to get closer to center of its operations. Of the 32 sites on Slack's transcontinental route, 28 are east of the Rocky Mountains. The move also cuts down on the distance to base areas between the general offices and various points on the system.

Although headquarters have moved to Dallas, the carrier will maintain the operational setup it had before the move. All maintenance still will be done at Burbank, with the exception of transitional maintenance on Atlantic flights done in Lockheed Air Service at New York.

Slack Fleet

Slack has now built its fleet to 11 C-46s, seven DC-4s and seven DC-6As. On May 1, the carrier plans to put another DC-4A in service when overhaul and modification work is completed. The transport is a damaged C-115 bought from the Air Force. Five more DC-4As are on order for delivery in the spring of 1955.

Like most other airlines, Slack would like to acquire more aircraft right now. Loading of military transports is a particular problem in the postwar, although the carrier isn't too concerned by present military attitude toward the leasing program. Slack is currently leasing one DC-4A from the Air Force and one from the Navy.

Slack Airways has an executive plan for moving into turbine-powered transports for cargo operations. Among its near possibilities, Slack lists the military C-119 and C-117, as well as cargo variants of the Lockheed Electra and the KC-135 tanker.

To provide for the expansion of its fleet, the cargo airline recently raised \$5 million in 10-year debentures. Chenoweth and Olsen Brothers set a precedent in air transport financing by purchasing \$3,333,000 of the debentures. Earl F. Slack and Tom Slack, directors of the airline, bought the rest of the issue.

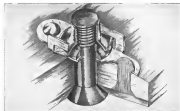
Cracked Question

The debentures are convertible to common stock after Jan. 1, 1958, but C&O's holdings are small enough that the two convertibles don't expect questions of control to arise. Along with the \$5 million debenture issue, Slack has arranged a \$7 million credit with a group of bank loans.

Slack's borrowings are limited by the five-year life of its operating certificate, which the Civil Aeronautics Board is nowed but near. The carrier expects to be issued a permanent certificate the next time it comes up for renewal, and it also expects renewal of its outlook to carry over when the new comes up the year.

Slack agrees with the contention of flying Tiger Line that freight rates

FASTENER PROBLEM



Lightweight floating anchor nut for bolting non-parallel surfaces

THE PROBLEM. Using large single forgings for aircraft bulkheads, wing center sections, spars and ribs offers manufacturers many advantages. It simplifies design and reduces welding costs, and it provides greater strength while reducing airframe weight. However, this type of construction also creates fastening problems. For example, attaching ribs and components to these thicker forgings is difficult because the bolt head and nutting surfaces are not parallel. Two methods are frequently used to make the fastening areas parallel. They are: 1) spot face machine the nutting surfaces, 2) build up each bolt head or nut base with tapered shims. Because there are often hundreds of fastening points, both of these methods are extremely costly and time-consuming.

THE SOLUTION. ESNA's patented lightweight self-locking anchor nut (Type LHA3002) solves this fastener problem, eliminates these costly, shimming and machining operations and significantly speeds up production.

Type LHA3002 consists of a steel nut body with a concave spherical base. The convex end permits the nut to move automatically with a ball joint action to engage the bolt threads. Two lugs attach the nut to the bulkhead and control the "id" to "S" in any direction.

Type LHA3002 is made of carbon steel for use at temperatures up to 350° F. It meets AN-N-30 performance and MIL-N-25027 (AMS) twist-and-push-out specifications. Like all Elastic Stop® nuts, it is vibration proof and reusable.



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Please send me the following free literature information:

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What self-locking fastener would you suggest?

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General Electric CJ-805 Offers Best Size, Weight, Thrust For Medium-Range Operation

Whatever your gross load take off range—from 134,000 to nearly 300,000 lbs—the General Electric CJ-805 can satisfy your over-all powerplant requirements better than any other jet engine. Here's why:

A compact, single-cotter design, the 10,000-lb-thrust-class CJ-805 delivers more power per pound than any commercial turbojet of comparable size. Because of the engine's small frontal area, nacelles can be made smaller, reducing drag and fuel consumption. Thus the CJ-805's power-weight ratio can help provide greater payload, shorter take off, and higher block speeds.

In addition, the CJ-805 offers features:

- **All weather operation**—Inlet guide vanes and struts are completely anti-ice.
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For more information on what the CJ-805 can offer your medium-range transports, contact your G-E Aircraft Engine Specialist. You can reach him via your nearest G-E Aviation & Defense Industries Sales Office. General Electric Company, Cincinnati 35, Ohio.

SINGLE-COTTER DESIGN WITH LOW MASS-TO-THRUST RATIO gives the G-E CJ-805 turbojet its small frontal area and light weight. First applications of the new General Electric engine will be the Convair 440, scheduled for 1968 service on TWA and Delta Air Lines routes.



ADVANCED G-E DEVELOPMENT FACILITIES are now speeding the CJ-805 development program. New turbine test stand allows in example of General Electric's continuing investment in future of U. S. aviation.



G-E DISTRICT AIRCRAFT ENGINE SPECIALIST is available to give qualified airlines more facts on the CJ-805: why the CJ-805 makes possible the ideal medium-range jetliner.

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V=fast

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CONTINUOUS SOLUTION
to this time integral...

... **IRE REEVES** comes up with the solution

Proving the world's earliest & first pre-determined orbit guidance system to the fifth degree. The second stage of the time-stage problem which will carry the satellite up to its orbit must be completed shortly before its trajectory bends back towards the earth.

Separation of the second stage is controlled by a tracking time computer designed and built for the Martin Company of Baltimore by Air Associates, Incorporated.

The Reeves Instrument Corporation has designed and is building for Air Associates the "timekeeper" needed for computing the second stage coasting time as a function of the burn-out speed. Essentially an integrating accelerometer, it provides a continuous record of velocity so the rocket speed builds up and feeds this information into the control unit's computer.

The control unit, after the completed coasting time has elapsed, triggers the system. Stage two is separated and stage three gives the satellite the final acceleration required for inserting it into the satellite orbit around the earth.

Because of its vast experience in design of precision gears and mechanisms, Reeves has been assigned the task of developing an important subelement. For use in one of man's great milestones, Project VANGUARD.

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should be used to cover increased costs, and the carrier would go along with the Tanager proposal 3/16 mile increase. But the company believes that a general overhaul of the stage site structure would be a better solution, and it is currently conducting a study of the site structure.

Electronic Reservation Equipment Ordered

Electronic equipment was ordered by three major airlines, moving the industry nearer to scheduled reservations landing (AW March 19, p. 45).

Eastern Air Lines and Western Air Lines announced purchase of their first electronic reservations equipment, and Pan American World Airways reported a cost-to-cost expansion of its present New York system.

Eastern is having a Univac from Sperry Rand Corp. and plans to install the equipment in a new \$5 million reservations center to be set up in Manhattan. The Univac will be linked with 157 agent sets in the New York area, and other sets in airports from Boston to Washington will be tied in by remote lines. The device will be able to store data on one million airplane seats up to three months in advance.

The airline plans later addition of satellite computers in 48 peripheral cities in its system, with the total cost estimated to be around \$10 million. Eastern's "electronic control center" in New York is scheduled for initial operation in October, with complete installation of all facilities by April, 1959.

Western has ordered a system from Teletype Corp. which will link telecentrally all cities served by the company. The system will provide information on up to 1,000 flight segments for 12 days in advance. Center of the network will be a regional office in Los Angeles, where ground information will be available to agent sets at each city. Centers will be installed at other cities in addition to Los Angeles.

Pan American, which has been using Teletype equipment in New York since last spring, has ordered from that company a system to connect the airline's offices in the U. S. and Canada. The system, which uses availability panels will handle reservations for more than 970 of the airline's flights for periods up to six months in advance.

Presidential Route Authority Faces Curb

Washington—Legislation sharply curtailing the President's authority on overseas and foreign affairs may soon have been approved by the Senate Commerce Committee.



The Chance-Vought Argonaut takes to the air. Precision scheduling assemblies for this and other guided missiles are part of Ex-Cell-O products.

Four typical scheduling assemblies for this and other guided missiles are part of Ex-Cell-O products.

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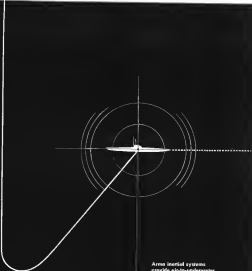
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ARMA

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- The measure would
- Make Civil Aeronautics Board decisions on federalized mail rates final. At present, the President proposes on them.
- Limit the President's authority to alter CAB decisions on foreign route issues to those pertaining to national defense or foreign policy.
- Require the President to report to Congress on national defense or foreign policy considerations for placing a CAB foreign route decision or its report to Congress, their national defense or foreign policy interests would be adversely affected if reasons were made public.

Similar legislation was passed last year by the Senate, but it came too late in the session for House consideration.

In its report on the measure, the Senate committee declared that the provisions for presidential review in the 1956 Civil Aeronautics Act "although originally intended merely as a means for executive review... have had the unfortunate, but perhaps inevitable, effect of transferring from the Board to the White House ultimate responsibility in every respect for the disposition of cases" dealing with on-cases and foreign routes.

It added: "The heavy to casual administrative and political procedures which this situation has created is readily apparent. Matters of an economic or regulatory nature which the Board, acting under the auspices of the Congress, is alone competent to decide and for which it alone is adequately staffed and ordered have somehow nevertheless become delegated to the executive."

Binaghi Is New Head Of ICAO Council

Montreal—Walter Binaghi, former member of Argentina's Ministry of Aeronautics, has been elected president of the Council of the International Civil Aviation Organization.

Binaghi succeeds Dr. Edward Warner of the U. S., who is retiring after serving as president since the organization's founding 12 years ago.

Binaghi has served as chairman of the ICAO Air Navigation Commission since 1949. He will assume his new duties in April.

Argentine Airline Orders Ten F-27 Friendships

Ten F-27 Friendship aircraft have been ordered from Fabbri-Cap by Aerolineas Argentinas. Flights will be made on the Argentine airline's domestic service.

Fabbri-Cap now has 55 firm orders for the turboprop plane, plus 25 options.



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Tu-104 Serviced at Irkutsk

Special ground teams are set up at Irkutsk to service Tu-104 at stops on scheduled flights to the Moscow-Khabarovsk trans-Siberian service, and Peking-Prague service. Aircraft flies from Moscow to Peking in 2 to 30 mins.



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Lebanon Balks at Air France Boycott

Beirut-Lebanon has told the Arab League that it will not join an Arab League order asking all member states to ban Air France, France Maritime Suez Sels and a boycott of the French airline would cause grave prejudice to Lebanese citizens.

If carried out, the ban would stop Air France from flying over and into Arab territory, making use of Arab air fields and maintaining offices in Arab countries.

Arab League boycott officials said that

French aircraft operators' payments for French land transportation facilities in Lebanon in compensation of Arab states' boycott regulations.

The Arab League ordered Air France last week travel bans on French while refusing to make the same for Arab countries' had become a member and avoided money in the Israeli Chamber of Commerce had issued \$0.000 francs bonds to the Israeli bond fund and had supplied technical information and staff to the Israeli government. French diplomats denied at unembarked those charges and Lebanese authorities accept the denial.

Lebanese authorities said in the boy-

cott of the French airline political activities and press economic trade. They said that since Israeli and French attacks on Egypt last November, Air France had considerably reduced its flights to Arab countries. It was forced to close down its offices in Damascus and Cairo, and to cease landing in Beirut and Egyptian airports and using the airports of these countries, as well as that of Jordan and Saudi Arabia.

The spokesman added that KLM which uses Damascus Airport both had services, flights, and offices in Beirut, and had not been boycotted.

Air France, which says operations are closed services to Lebanon and Iraq will resume two new flights through Lydda Airport this month in response to requests from the government of Israel. New Super Constellation schedule will be flown Paris-Tokyo via Rome, Lodi, Tel Aviv, Beirut and Raqqon, and the second service will be New York-Pan-Lodi.

CAB Would Modify Check Weight Rules

Washington—Civil Aeronautics Board has proposed a revision of Civil Air Regulations that would eliminate requirements for actual or simulated gross takeoff weights in pilot performance checks.

Because of the wide difference in between maximum takeoff and landing weights of modern transports, the CAB has found that pilot training with an actual or simulated certified weight has become an impractical procedure.

Present regulations require aircraft to be at maximum takeoff weight when pilots are undergoing recurrent proficiency checks with one engine inoperative. Some airlines have been using reduced power or handbraked takeoffs to simulate maximum weight but most cannot justify the use of lighter or simulated gross and cargo weights.

The CAB has decided, however, that better is impractical because of risk of lag and on-loading delays. In addition the CAB may dropping of fuel or ballast is an impractical procedure.

Use of the hand compassing principle to set takeoff weight is maximum landing weight requires some aircraft to remain aloft as long as eight hours.

Under Draft Release 77-2 the Board has suggested its Bureau of Safety Regulations to prepare the amendments to Civil Air Regulations for a May 25 effective date.

The ruling will apply only to periodic flight checks and not to actual pilot training for simulated engine failure at actual or simulated maximum takeoff and landing weights or in approach configuration.



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READY FOR FLIGHT, second prototype Bell H-40 displays low silhouette, broad rotor capable of saving its people. In tests to date, the H-40 has flown above 10,000 ft. altitudes and achieved speeds in excess of 75 kt. It will do better than 100 kt.

Bell H-40 Stresses Economy to Meet Army



EASY ACCESS to H-40's power section is demonstrated by Bell personnel. Learning F13 derived free turbine (upper left) delivers 700 hp to transmission (upper right). H-40 is expected to go 1,000 ft. between overhauls.



EASY EQUIPMENT, rack-mounted in helicopter's rear for easy removal and replacement, is exposed by lifting large access panel. Thus, flight test and two static test H-40s, even YH-40s are in order.



EASE OF MAINTENANCE is demonstrated by lifting H-40 back on tubular wing bent/crooked ground handling wheels at rate of 10 ft. per sec. Body is built around, numerous access panels and built-in markings are planned to simplify front-line servicing.

Demands

At Worth-Bell Helicopter Corp.'s new turbine-powered H-40 Army helicopter is under going Phase I flight testing here following approval by various States of Flight Inspection Board.

Second of three experimental flight test models has been rolled out and is detailed in the accompanying pictures. Two static test models and seven YH-40 service test articles are also in order.

H-40s will be delivered to the troops in 1959, according to Brig. Gen. J. B. Howell, chief of U. S. Army aviation.

Maximum accessibility to all major components and long life of parts is among the design highlights of the H-40 and were high priority in its planning to meet Army demands for easy maintenance and lower test schedules. Bell expects it will be first helicopter with a 1,000 hr. period between major overhauls. It has most rotor blades.

Gross weight of the six-place utility helicopter is 5,194 lb. empty weight is 1,774 lb. It is designed for a 1,000 lb. payload, will cruise at better than 100 kt.

The 825-shp Lycoming F13 turbine, rated at 700 shp, will provide a test rate of climb of 1,000 ft./sec. and out-of-ground effect hovering ceiling of 7,500 ft. on a 95-deg. day. Pull-out range will be 250 nautical mi.

Bell officials also foresee a market for a civilian version of the H-40.

NIGHT FLYING INSTRUMENTS are included in cockpit equipment and there is provision for disorienter counter-measures. Among H-40's key features is pilot-controlled night flying of rotor blades to maintain trim and provide smooth flight.





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This new TRANSISTORIZED CONTROL AMPLIFIER weighs only 13 ounces...but it is a vital control element in the voltage regulation of an entire aircraft fire control system. Developed as part of an integrated power supply, the "MIGHTY MIDGET" operates from -65° to $+125^{\circ}$ C...reduces ripple to less than 50mv peak-to-peak...is adaptable to voltages of ± 50 to ± 1800 ...controls voltage regulation to $\pm 1\%$. Here is another example of Packard Bell's skill in developing lighter, more efficient electronic equipment...another result of more than 30 years of electronic leadership.

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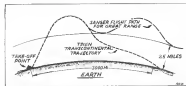
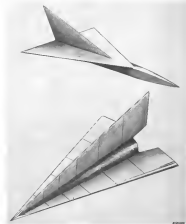


DIAGRAM roughly illustrates two hypersonic proposed for long-range rocket-powered aircraft. Such flight paths are completely beyond today's powerplants and airframes, but represent the ultimate goal of current work. Rocket engines burning several hundred times as much of thrust would be required to propel transport vehicles through the hypersonic sheath. The underlying path was suggested in Germany during World War II, the expert is, Dr. Hans-Joachim Tietz of Cal Tech.



MODEL shows one of the typical of those being developed by the NACA in their effort to provide basic hypersonic design data. Some problems are to reduce aerodynamic heating, improve high-speed stability at altitude, increase lift-drag ratios at all Mach numbers, and provide safe landing configurations.

Hypersonic Glider Studied As 'Manned Missile' Hope

By J. S. Bate, Jr.

New York—Hypersonic glider, under intensive study in the U. S., is regarded by the National Advisory Committee for Aeronautics as probably the most effective means of giving manned aircraft missile values.

One of the first steps in aircraft evolution prior to the true space ship, the hypersonic glider is not only the subject of active study by NACA, which is seeking basic answers (AW No. 11, p. 51), but also by General Dynamics, Convair, Douglas, and Bell Aircraft Corp. under USAF contract.

Based on a concept considered as late as the Germans during World War II, the present work is backed by twelve years of continuous progress and is actually spoken of as the infant of the new future. Dr. Louis A. Doolittle, Chairman of NACA, recently declared that hypersonic glider, which the hypersonic glider is ultimately called, would probably reach the commercial stage within the lifetime of many adults if progress in gas-turbine jet-pact with progress in aerodynamics.

The Soviets have been actively interested in such aircraft since the end of the war, when German progress became known in detail to the Allies. A Russian fighter model carried the first engine in England in 1947, and the Russians successfully attempted to build up engines. Since, personnel German assumed rocket scientist, he also brought the last information of Russian progress toward a reliable vehicle.

Flight Program

Test portion of the hypersonic glider probably would resemble that of a ballistic missile. The aircraft would ascend on fuel as a maximum power climb, and rise above the atmosphere. The rapid climb would provide the greatest acceleration potential and kinetic energy. Drag effects would be reduced by limited operation in the atmosphere, and the propulsive efficiency of the rocket motor would increase with vehicle speed.

After fuel exhaustion the aircraft would continue in a ballistic trajectory, determined by weight, the direction of the thrust axis, and the forward speed at the instant of power cut-off. The glider would be able to pull-out of the trajectory, as it reentered the atmosphere and developed lift.

Two general procedures have been proposed for the remainder of the flight.

• Lift and kinetic energy of the

vehicle would be used to propel it back into space as another ballistic trajectory. This reentry and climb into space sequence may be repeated as long as there is sufficient kinetic energy. The flight path would resemble a strong skipping across smooth water, a program first suggested by Sänger to his astrophysicist (and his wife) brother-in-law, the Luftwaffe. It would be possible only for ranges greater than 3,000-4,000 mi.

• Hypersonic glider could be held at maximum lift-drag ratio in space as the fuel cut and burn accomplished. This would allow the vehicle to remain at altitude for the longest period, and its speed would be reduced to a safe point before descent was initiated. It also provides the maximum speed for this type of flight program. The German made program in Germany planned this method for its A9-A10 project, for the bombardment of New York. Later, Dr. Hans-Joachim Tietz in the U. S. suggested it for a transcontinental passenger rocket.

Following these other dramatic maneuvers the glider would be expected to land in the conventional manner and in contemporary speeds.

Feasible Configuration

The composite approach, which usually produces a successful airplane out of a battery of conflicting requirements, will be stretched to the limit with the hypersonic glider. As it is envisioned today, this glider will have to function in almost every conceivable speed-altitude situation. Its maximum speed will vary from space level at Mach numbers well into 16, through hypersonic and supersonic speeds in upper stratosphere down to low and slow flight at the earth's surface.

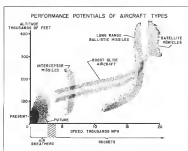
Hypersonic supersonic and subsonic design principles are in contradiction that the only solution may be a long and complex, variable geometry configuration.

A primary problem, typical of the situation, is the selection of a wing. It will have to be swept about 60 deg to reduce aerodynamic heating to a value that can be handled by an internal cooling system. It will have to be very thin to keep supersonic drag low, and it will have to be of low aspect ratio to be structurally feasible.

At subsonic speeds, the wing must be a poor lifting surface area with high lift and blowing.

It probably will not be adequate for

the wing also has a low lifting efficiency at all speeds, and the effects of the



THIS CHART is a NACA prediction of the operating stages of future manned and unmanned aircraft. Boost glider lies in NACA calculations for vehicles which generally are powered during first 100 miles of flight, then show atmospheric, upon reentry reach their destination in a hypersonic glider, and land conventionally.

glider is directly dependent on a high velocity.

Another problem is the fuselage, which should be long and narrow for low hypersonic drag. However, this gives the body a large moment of inertia which requires more control surface area and is true only to the drag.

Powerplant Demands

Any hypersonic glider prototype able to take off itself and leave the atmosphere long enough to be of real research benefit (several minutes) will require a neighborhood of 100,000 hp of thrust.

This is considerable mass power that has never been installed in any manned rocket in the U. S. The X-2 had the 15,000 hp.

The same requirement is duplicated with larger powerplants and heat and some are used as controls, but as balloons, has not been developed to the point that their designers would like to stand beside them each time they are started.

Pending the further refinement of high thrust systems, the experimental hypersonic glider probably will be powered in stages or with several smaller motors in a subsonic or

The hypersonic glider's most serious stability problem would occur in the atmosphere. This is the same case which hinders the design of current high speed planes, with a few more added.

Primary task is to contain the often violent center of pressure shifts occurring on leading and lifting surfaces in velocity, shock wave patterns and flow separation changes. Control of pressure on both sides of surface must be held within narrow limits if an aircraft is to have a natural tendency to return to a given flight path after it has been disturbed. To date, the actual tendency (i.e. static stability) has not been achieved about all cases on any high performance plane without the aid of automatic devices, known as automatic velocity control, which constantly compare actual position with desired position and correct it.

Next, a most heinous problem is the rapidity of change in the velocity of the vehicle. These conditions may cause loss of the controls as well as from gusts or other outside disturbances. The pilot is present, more or less than controlling and, during serious (other than its aerodynamic) it passed and the designing



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ing. However, except near the transition point from turbulent to turbulent flow in the boundary layer (laminar on the wing).

The heat absorption point, at which the heat input from friction is balanced by radiation is considerably higher under a turbulent boundary layer. Therefore, there is an optimum sweep angle for a given structure.

Using sweep and a high thickness, when building the internal cooling system, most of the heat could be held at a reasonable level. The wall area which would heat enough to require internal cooling would be the nose and wing leading edges requiring a small coolant flow. The remainder of the glider structure could be kept at safe temperatures by radiative cooling and convection surface.

The first proposal for a curved, long range, hypersonic aircraft was made to the German government during World War II by Dr. Siegel, an aeromedical engineer noted for his work with rockets and Dr. Hans Bredt's physicist. This was a lengthy proposal dealing with virtually every phase of the problem and of such quality that even today it is of more than historical significance.

The proposed aircraft was called an antipodal bomber and was to be able to attack any target in the world and return. Its flight path would resemble a stone skipping across the water.

As with any paper which deals with a subject largely beyond contemporary thinking and knowledge, the Siegel-Bredt report based more of its main points on supposition than facts. Experts cannot find information since its publication has shown that nothing in aviation, so the antipodal bomber could be achieved even today. Two points vital to the design of the Siegel vehicle, which have proven unattainable to date are a rocket exhaust velocity of 4,000 miles per second, and an aircraft capable of flying into which is as high as Mach 10 is at Mach 7. The basic concept, however, is still considered sound.

Another German project, the A-9 A-10, developed to beat the current U. S. was concerned along similar lines. This was a marriage racket of which the second stage was a modified winged and modified V-2. The second stage had been built at the end of the war but the latest stage matched an existing main engine and was not developed. It is probable that this vehicle could not have crossed the Atlantic in its range, otherwise it was based on Siegel's 140 day production.

Subsequent proposals of rocket propelled missiles in flight go to the A-9 A-10 and with transcontinental range have been made by Dr. Victor De Winter-Daewler and Kofke-Wander.

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WHEN THE ZAHODIAKIN detector and a second 4 pole intermediate drive drive the three rates up on the side-angle thrusts on the impulses and wedges around the stud as you think.



Fastener Designed for High Temperatures

Ability of the design to withstand temperatures up to 1,000°F is claimed for a new fastener used to be installed by Victor P. Zahodjak, Scientist, N. I. Zahodjak's new Model X fastener was designed to meet the strength and exact the temperature needs stated in NAS 547, a technical specification issued by the National Aeronautics Standards Association of the Aircraft Industries Association, Washington.

It is a very simple design. Tightening the stud causes an extraordinary stress to build up on the wedge and the wedge and close as upon the stud.

Room temperature tests indicate the Model X in a No. 3 size (6 in. dia.) could withstand:

- 7,500 lb. shear load against the 3,100 lb. load called for by NAS 547
- 12,000 lb. axial load without failure through perpendicular hole 50% open
- 107,686,000 cycles of vibration and fatigue at 3,100 rpm, 2 in. amplitude with a 500 lb. load pulling at a 45 degree angle. NAS 547 asks for 20,000 cycles at 1,800 rpm at right angles.
- 25,320,000 cycles without failure when 31% open
- 41,472,000 cycles without failure when 52% open.

As the shear failure was caused by

Vickers Servo Pump Systems

Provide rapid and accurate response to minute electrical or mechanical signals

The Vickers Servo Pump Unit shown at the right is a signal-controlled, variable delivery, positive displacement, reversible flow oil hydraulic pump. In combination with a rotary or linear hydraulic motor, it forms a signal-controlled hydraulic transmission for remote control operations and high-response servo systems.

The servo transmission may be considered as a power amplifier when viewed from the electrical signal input, of about five watts, to the mechanical power output of several thousand watts. Various sizes of transmissions have been built, having output capacity ratings from one to four hundred horsepower. The servo pump design is such that pressure required to move the load . . . which means reduced pressure over the greater part of the system life span . . . loads occur only infrequently in the majority of systems. This greatly reduces power losses and minimizes heat rejection.

Any type of prime mover of sufficient capacity can be used to furnish the power input—electric motor, battery driven pump on an airplane engine, air turbine, hydraulic motor, etc. Substantially constant speed is desirable.

Variable Pump Volume Controlled by Signal

Heart of the servo pump unit is the Vickers Variable Stroke Hydraulic Pump. This is usually a non-cylinder pump, housed in a portable cast-iron yoke. Varying the yoke angle varies

piston stroke, hence, output volume from zero to maximum in either direction of flow. A stroking piston actuated by a pilot valve varies the yoke angle according to signal.

Low Control Power Requirement

Power for control purposes is low in a servo pump unit because reversing valve action is confined to the volume-reducing system which is a few horsepower (100 to 300 psi) hydraulic system separate from the power transmission hydraulic circuit although a part of the pump unit. This volume-reducing system controls piston displacement and direction in the power pump which can operate at pressures up to 2000 or 4000 psi. Pressure drop across ports of a metering valve, with an inherent loss, is avoided in the power transmission system. Load pressure from the pump is determined by the volume of flow which the volume-reducing system demands and by the actual resistance of the load . . . is not dependent upon pressure drop methods of control.

In a control system employing the servo pump, the variation in gate opening from load change is negligible compared to those which may occur in a metering circuit controlled by a valve reacting directly in the power line.

Constant Displacement Hydraulic Motor

Flow and pressure generated in the hydraulic pump are controlled by shifting

with no intermediate valving in the hydraulic motor or linear actuator. The fixed stroke hydraulic motor provides torque directly proportional to pressure and speed directly proportional to flow rate.

High Power-to-Weight Ratio

The servo pump unit and its associated hydraulic motor are designed for high power-to-weight ratio, high torque-to-inertia ratio, low inertia of rotating parts, and high response frequency.

Typical Example

High speed to stroke—15 ft/min (linear unit)
High torque to inertia ratio—2.5 ft-lb/in.² (rotary unit)
High volume of output—10 gpm (linear unit)
High pressure—2000 psi (rotary unit)

Other advantages are reliability and versatility of application. The transducer



studies speed changes and ability to hold position against any variation in load are additional reasons why this unit is a desirable resource which can solve many design problems.

Important among the applications of Vickers Servo Pump Units is extremely fast and accurate positioning of gun barrels on aircraft. Another is automatic de-icing of aircraft wings for jet engines. Here the servo pump's characteristic of providing at all times only sufficient power to meet the momentary demand minimizes the power loss and transforms the heat rejection. The greatly reduced average pressure level in this type of system prolongs the life and improves the reliability of all components.

For further information, ask for Bulletin 35-15 and 35-16 or get in touch with your nearest Vickers Aircraft Applications Engineer. He can arrange for an engineering study to consider your problem and propose an optimum solution.

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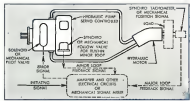
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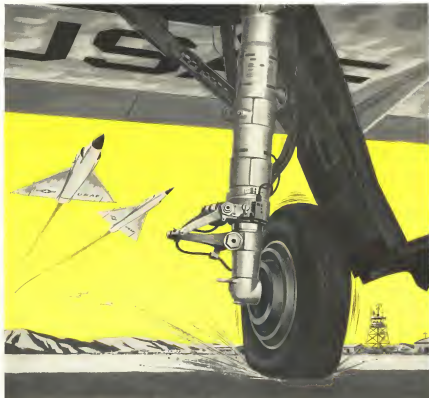
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SIMPLIFIED DIAGRAM illustrates a servo control system employing Vickers Servo Pump Unit and Constant Displacement Hydraulic Motor. The system accepts arbitrary signals (either electric or hydraulic) and converts them into type of response (linear with feedback) equal to flow and (through controlled change in direction and volume of fluid pumped to motor) controls the load as required. For added accuracy and stability, a load pressure feedback signal proportional to rate of flow may be fed back into the pump in the form of a mechanical "offset valve" which results in controlling the flow as a function of the net signal (pump or motor) or as a function which feeds a signal proportional to flow rate into the regulator. The controlled output may be either a function of the position or velocity of the load.



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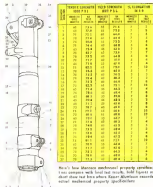
This landing gear forging, produced for Menasco and used on the Air Force's Convair F-102A jet interceptors, is proof of Kaiser Aluminum's ability to produce high quality forgings that not only meet exacting mechanical property specifications, but often exceed them.

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he can now produce the Model X within the tolerances necessary to make a turbine of this type work. He will produce test cases from 7 to 4 in., ranging from 2,000 to 10,000 lb. shear load, from 5,250 to 14,000 lb. tensile strength and with maximum stress peaking ranging from 125 to 250 in. Thus, turbines will have low-potential loads from 550 to 1,600, but special steel fastener good for up to 2,000 lb. will be produced as order.

The ability of the Model X, to clamp warped parts that was illustrated by a No. 7 one which flattened a 1/2 in. curve out of a 1/2 in. thick strip of spring steel plate, 21 in. wide x 1 1/2 in. long.

If it proves successful at temperatures from 1,000°F to 2,000°F, the Model X might be used by engine manufacturers to permit rapid removal of data for historical aspects of fatigue, heat, mass, engine, aircraft, and perhaps even engine lower temperature metal erosion chambers. It might be used by air frame and engine manufacturers for some time across joints which must also bear structural loads, for mounting engines to airframes and to form high temperature gas ducts.

Hughes Inaugurates New Student Plan

A plan to aid undergraduate students in the engineering field has been inaugurated by Hughes Aircraft Company. The new study plan would give them full payment of college tuition and a \$100 expense allowance, working part time in their chosen field.

A previous scholarship program, begun in 1955, has aided approximately 600 employees studying for bachelor's and master's degrees, plus another 30 studying for doctorate.

Under the new program, junior and senior students in electrical, mechanical and industrial engineering who qualify will work 20 hours a week at the Hughes H-30 grade plant. Working hours will be arranged so that they will not conflict with classes.

University of Los Angeles, the University of Southern California and the University of California at Los Angeles are now joining the plan placed by Hughes Aircraft Company officials. Students will be permitted to earn from 9 to 15 units of upper division engineering each semester and 3 to 6 units during each half of the double summer session. They will be allowed to spend up to 7 years in the program while completing their college studies.

Applications are being accepted only by writing and should be addressed to Hughes Aircraft Co., Human Dept. Box 44502, Airport Station, Los Angeles, Calif.

AVIATION WEEK, March 18, 1957

Vestigia Energae Remanent

A screen dating back to the Renaissance... rapidly adopted through modern scientific techniques... afforded new often significant new answers to many mystery problems. A natural replacement to relate and explain physics... the use of infrared for detection purposes has been enhanced basically by these factors:

All objects are natural radiators of infrared energy whenever molecular motion exists.

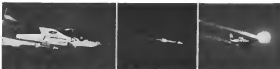
The more active the object... the more radiative its, focus and fusion processes, jet engines, solid and liquid propellants, aerodynamic surfaces, evaporating vapors, combustion products, incandescent bodies, the horizon, and the earth itself are all substantial infrared radiators.

The present state of the Art permits the detection of objects having temperature differences of only a few degrees and also these lie far away to 300 light years. These IR systems are suitable for a wide range of applications including early warning and detection, search, acquisition and tracking, identification, communications, infrared spectroscopy and absolute thermometry, detection, observation, ranging, depth, concentration, detection, defined can be used alone in a completely passive system, with other active or passive radar, with optical systems, and with electronic systems to perform a wide variety of tasks. Of course, many of these developments are under development and some are conditional.

Whether your concern relates to a current application of infrared, derived from the greatest State of the Art, or to future weapons systems, based on sound research and development, you are invited to investigate Avion's experience in this field. It dates back to 1949... is supported by a staff of experienced physicists... and profits from a valuable accumulation of pertinent data. This scientific team, equipped with modern laboratory facilities, is well qualified to go to work for you.



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SIDEWINDER in test cruise fired from Navy fighter jets target base on POF down range. Missile seeks heat source, so even deft it has locked such that down down without destroying the aircraft.

Navy Demonstrates Zuni, Sidewinder, Terrier



AIR-TO-GROUND Zuni experimental Mach 3 missile, explodes on target in China Lake (NOTES: It will replace current BVAAs)



TERRIER missile drops from Marine Corps mobile launchers were recently demonstrated. Target was POF down.

SUPERSONIC shot down in shoring position, on its back at China Lake is used to test missile and aircraft components e.g. nose cones, vented surfaces. Various surfaces in use of dual body air test models. Shot, called SNORE, is shown powered with Arcosil liquid rocket, but may use a variety of propellants.



FLAME-PROOF FABRIC CONNECTOR ELIMINATES

"fire zone" fatigue



Arcosil connector replaces metal on engine vehicle duct.



Adapts to flange forming and alignment.



Adapts to flange forming and alignment.



Many types and sizes.

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Close tolerance tooling and production costs are cut as a fraction, as compared with metal, to effect sizeable savings in other experimental or production quantities. Up to 50% weight reduction is possible. Flexibility permits creating without damage and simplifies installation.

Arrowhead specializes in solving difficult flex-connector problems in fact, fuel and air systems. Arrowhead field engineers will gladly provide further information and assistance.

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Marquardt controls engineers solved many of these problems more than five years ago when the company began flying ramjets at supersonic speeds. Today, this ramjet knowledge is being applied to turbojets which are now advancing into higher supersonic speed ranges.

Pneumatic, hydraulic, or electronics controls engineer, ready for advanced creative projects, are invited to explore the opportunities at Marquardt. Contact or send a personal resume to: Jim Dale, Personnel Personnel, 16555 Satway Street, Van Nuys, California.

Visit our booth at the S. A. E. Show, New York City, April 2-5.



NEW YORK CITY INTERVIEW—Marquardt's 4 Chief Engineers will be available for personal interviews in New York City, March 28-April 2. For appointment, please Jim Dale, Recruitment Person, Marquardt 165-8885.

AVIONICS



MANUFACTURE of infrared thermal detectors involves precision fabrication techniques. This sort of triple mode sensor, 14 inches or less in thickness, must be cut into fibers as small as 0.1 mm. Fibers then are processed and base electrical wires attached.

Exclusive Report on Infrared: Part III

Funds Lag for Basic Research on Infrared

By Philip J. Khan

Infrared sensors are threatening to reshape the state of the art. The military must channel more funds into basic component research and development, infrared experts note.

Current infrared sensor development already are pinched for lack of detectors, optical subassemblies and optics suitable for use in high-speed high altitude aircraft and missiles.

This is a direct result of the long run when there was relatively little military interest in infrared systems, and less money for support.

Within the last year or two, military interest has mushroomed, spurred in part by the remarkable success of the infrared guided Sidewinder anti-air missile. Another factor spurring military interest is the state of the art of radar, which has reached a point where even small gains in performance do not come easily.

Basis R & D Slighted

Despite the interest, and perhaps because of it, the vast majority of military infrared funds are now going into system development for specific weapons. Basic R & D, money is going into

Basic IR research and development

Too much money for system development is not enough for basic research and development is a complaint not confined to the infrared industry. Perhaps the reason that military people are so outspoken is that their systems usually compete with radar which has received vast sums for R & D during the past 15 years. One old timer in the infrared business estimates that radar has gotten roughly 10,000 times as much money and effort as infrared, if production effort is included with R & D. Certainly, production experience does help advance the state of the art.

In any new technique, progress toward ultimate performance is slow, and depth proportional to the numbers and/or dollars invested. At the start, considerable effort is required to produce ten rocket engines. Then, as the curve shows, significant gains are achieved with relatively little invested effort. Finally, a saturation point is reached and further performance gains again become costly in terms of invested effort required to achieve them.

Many observers believe that radar has entered into the area of diminishing returns while infrared has yet to achieve its potentialities. If some sufficient funds were made available for infrared research and development, the state of the art could be advanced in a proportion



INFRARED stands at threshold of major performance gains with little added effort whereas radar is nearing point of diminishing returns, infrared supporters claim.



TYPE 21 ADF
WEIGHT ONLY 19.7 POUNDS
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NEW LOOK in navigation aids

The Time Tested ADF Now In Less Weight, Less Space

The ADF is a basic air navigation instrument, used in all parts of the world, available to some 60,000 transmitters. But the important thing now about the ADF is that ARC has engineered an ADF system down to less than 20 pounds in weight, with a comparable saving in space.

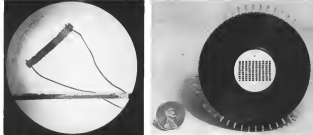
Now pilots enjoy the advantages of dual installations of this compact lightweight equipment at tolerable weight and space requirements.

The ARC Type 21 ADF is built to today's more critical speed and environmental demands. It has harmonic tuning of vital components, such as the entire loop assembly. It covers all frequencies from 190 kc to 1750 kc, operates on only 2.8 amps at 27.5 volts dc input. A significant feature is the extremely low loop drag—only two inches below the aircraft skin.

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MICRO-MINIATURE detector element shows alongside known how to use impedance, a technician need to make large coils almost instant, the 200-ohm resistor shown right. Mounting detectors on silicon support-substrate systems to permit rapid mounting. Mounting substrate between each of the key coils is a difficult problem.

where greatly improved antenna performance would be possible, this discovery may.

Infrared systems are now able to outperform radar in the near future with less complexity and cost, in a number of applications which include remote target detection, mapping, and detection against certain types of targets. For example, it is possible to build an advanced infrared system for guidance or intercept fire control that works and costs only about 1/10 as much as a radar system, and provides better detection with a 4-6 m. scanner than a radar with a 2-4 m. dish.

Detector Need

Although manufacturers of infrared detectors today are having out for better units than were available just two years ago, all infrared system designers clamor for further improvement and that means more R & D effort. The detector, which converts infrared energy to electrical signals, more than any other single component determines the capabilities and limitations of an infrared system.

Most detectors would have high sensitivity across the entire infrared spectrum, with low noise and fast response time. Thermal detectors have made ideal midband components, but their sensitivities and frequency response are comparatively low.

To increase the sensitivity and frequency response of thermal detectors, manufacturers have used thermistor films to the point where the size of the sensitive area is about the diameter of a human hair, and the thickness is less than 0.001 in. Considering that the film is made of a

fragile oxide material, and must have been loaded to it, further performance gains will be difficult to achieve.

Although photoconductor-type detectors have sensitivities of 10 to 100 times that of a thermal detector, their response falls off sharply at the longer wave lengths. This highly characteristic feature of the system which must work against low-temperature objects.

One way to extend the responsiveness of the photoconductor is to cool it to the temperature of liquid nitrogen or oxygen, but this involves added complexity and increases system weight and cost.

Research in semiconductor materials has resulted in improved lead sulfide and lead telluride detectors as well as new materials such as silicon arsenide and specially treated germanium which are responsive not to 7-9 microns. Specific sensitivity figures even as the long wave infrared and lead telluride detectors are classified in the U. S. although British engineers have each published comparable data on these detectors.

Photoconductor Hopes

Photoconductor detector field effect gains hope for a major improvement over the thermal type does, although it has certain inherent physical limitations which may prevent anything approaching a breakthrough.

Lawrence G. Rubin of Raytheon, speaking before the recent Institute of the Aeronautical Sciences meeting, said that "as our knowledge of semiconductor increases, we approach the time when we can turn make a photoconductor cell to have almost any threshold wavelength of response and, over a

limited range, almost any time constant."

Greater uniformity of characteristics between individual detectors in a batch is possible than in mass production systems without expensive preselection in another design step, despite considerable recent improvement in detector uniformity. One reason is the more uniform use of the detector elements which require laboratory-microscopic manufacturing techniques.

Time Constant

The problem applies to thermal and photoconductor detectors, but the latter has most of the criticism. One lead sulfide detector manufacturer's detector literature says that the time constant of individual cells of one type may vary as much as 250% and their output signal may vary as much as 25% by the same infrared constant. The manufacturer's explanation: "This is a built-in defect, the detector appearing as an undetermined function of the deposition process which is presently aimed toward material having maximum signal output characteristics."

One thermal detector manufacturer expects to make significant progress in reducing greater uniformity and in lowering detection power, which currently runs \$100-200 for individual type units. The company also reports that it has developed a technique for putting a film on its thermistor film which can have the purpose of the spectrum to which the detector is sensitive, if so desired.

Multi-cell sensors are used in some infrared systems when the response time of a single cell is too slow to pro-



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EQUIPMENT

New Fire Detection Bans False Alarms

By George L. Christian

New York—New type of continuous fire and exhaust detection system for aircraft, named as Liberty tube fire alarm, has just emerged from the laboratories of Fenwal, Inc., after two years of development.

Features of the system is a heat sensing of temperature rise (rise to 100°F), a pendulum-style sensing apparatus of the length of detector exposed to the heat. A 20 ft long heated section of heat detector will alarm only 100° lower than a 30 ft section.

Generally used, thermocouple-type continuous detectors tend to average over heat conditions. A relative low heat exposing on a long length of detector will give the same warning as a very hot, concentrated fire will produce on a much shorter end of cable. On a typical thermocouple detector, if a 10 ft section alarms at 550°F, a 20 ft section will alarm at 550°F, or 200°F lower, if the entire 20 ft is exposed.

The Fenwal detector has not yet undergone wide speed, night testing, but it is being tried on at least one commercial aircraft, according to the manufacturer.

Point of Controversy

Fenwal contends that the big speed of thermocouple continuous detection system is a serious source of false alarm. Thus, if an area adjacent to jet engine is safe at 550° and then to reach 550° to become dangerous, the thermocouple detector will give a false alarm at the lower temperature of a sufficient length of cable is heated.

This is dangerous and costly, Fenwal said. In single engine aircraft, which are not equipped with fire extinguishing system, pilots usually bail out at a fire or overheat warning, costing at least the price of the plane.

Over the last few years, commercial airlines have been unable to fire the alarm in the millions of dollars.

Losses are attributable to making emergency, unscheduled landings, grounding of the aircraft, special maintenance to seek cause of mis-activated fire signal system fire processors, and many other costs, items.

Thermocouple continuous detector manufacturers like use with Fenwal's claim. Here is what they told Aviation Week.

• **Walter Kable & Co., Inc.**, Warns of 400° temperatures at least that are safe up to 600°F can protect major fires. Suppose a 400°F overheat condition occurs in the area, but at a corner where it does not engage directly on the detector. It is almost impossible to strong detector cable in every spot where a fire might occur. At some in a long series of detector cables 400°F, an alarm is failed to the pilot that something is wrong long before the detector reaches 600°. This low warning may mean the difference between controlling or not controlling the fire, Kable contends.

• **Deane A. Feltus, Inc., Instrument Division**, Matching a detector's operating temperature range with heat to be controlled, coupled with maximum application engineering of the detector in the area to be protected, makes it impossible for fire warning system to

give false alarm. The detector is of a type and it is so installed that it will not operate at the engine's maximum allowable operating temperature, but will alarm when fire temperature is exceeded. Otherwise, the comparison, its continuous system would not be acceptable to the aviation industry.

Sperry Gyroscope has an active fire warning fire detector study underway in its laboratory, with emphasis on high temperatures. Although the firm has made several proposals for its status no hardware has yet been produced.

Hot & Reliable

Fenwal's detection system is made up of two components: a sensitive heated tube temperature sensing element which is installed in a continuous cable in the area to be protected, and a magnetic amplifier control unit which senses electrical changes in the detector and operates the alarm.

The detector cable is currently available in several models with temperature ranges up to 900°F. A 1,200° model will soon be available and a 1,700° version is in the laboratory.

The system's control unit is a pulse-amplified, hermetically sealed magnetic amplifier. When alarm temperatures are reached it amplifies the current changes in the detector and lights two indicator lamps directly in the pilot's seat. It can also engage a head rule, for a master warning control or other emergency equipment. Use of the mag amp does away with warning tubes, transmitters and relays which are subject to wear and failure. The unit is mounted so that it does not require check mounting. Not being position sensitive,



DETECTION LOOP hookup has control unit, detector elements, three types of connectors and mounting clips. Unit hasn't yet been through night testing.



PRETZELLE leads in action roughly 25 ft long shows flexibility of detector.

it can be mounted in any direction.

The system's detector is made up of the faceted tube filled with a mixture of inorganic salts which conducts the outer sheath from a control panel via wiring around, monitoring agencies, a low-voltage relay connected to the detector by the control unit. When an ionospheric disturbance occurs, the resistance of the salt filler drops sharply, allowing a large increase in current flow between user and meter tube. This current change is sensed by the control unit which activates the alarm.

The tube usually is standard 10 ft. lengths for ease of handling and installation. Several sections of cable with different impedance allow them to be hooked together to operate from single control box and each will operate according to its particular specifications. The smallest is 0.05 ft. in dia. and lightness (0.05 lb. per foot) of all the detector make it highly vibration resistant. Also it cools and therefore resists self-heating.

Being very flexible, it can be hand-adjusted to any desired shape. It will follow curvature as well as the diameter of a pipe.

The detector mount operates at a low impedance—25 ohms—which makes it almost completely undetectable to radar.

Prezel says that the detector has a high degree of repeatability with very little variation from a predetermined frequency. The entire system will continue to function normally with a detector cable loop completely severed, and it will find itself.

Kiddie and Prezel also have a new fire detector in store.

Kiddie has a new system called a micro-processor based on-chip detector. The quantitative aspect of the system allows it to sense, not only of an on-chip condition but of how much of an on-chip condition, providing the best one is present. Typical warning starts with a flashing and light to indicate on-chip. Light becomes steady when temperature reaches the danger point.

The new system has received R&D approval, according to Kiddie. It is currently installed on each aircraft as the Martin Jetprop F8M SeaMaster fly-

ing boat and the T-48, gas turbine-powered helicopter. Kiddie says that the on-chip detector will go on all three U.S. Navy helicopter-powered transport—Boeing 707, Douglas DC-8 and Lockheed Electra.

The company, which also has non-invasive sensors on such as airplanes as the Grumman F111, B-1 and General B-55, claims to have the lead share of the continuous gas detector market at the present time.

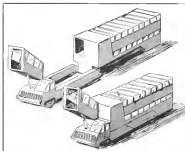
Edison's latest developments include:

- **Dead function:** continuous detector for exhaust fire warning which will give flashing light for repeat trouble and a steady light when the situation becomes critical. The system is similar to Kiddie's.

- **Transistorized control unit:** good to 2500° which will operate both under and over.

• **Resistant cable:** which is equal to or superior to the previous model cable to test made by the Civil Aeronautics Administration. Edison says that the ruggedized cable had not been a single fire in 32 individual tests. Average response time was 2.9 seconds.

Edison lists three phases in using its continuous detector: Census T-902A



Double Deck People Pod

Sketches of Clark Equipment Company's latest people pod proposal (AW June 18, 1976, p. 102) call for expansion to a double decker version with a capacity of 50 passengers. Weight of passenger loading may be double their's only can be adjusted hydraulically to match plane's maximum door. Crew will walk up passageway at departure location if it is in trouble, then down to landing waiting at parking area at end of runway. This second plane's, especially for, having to two long distances and eliminate the clutter of aircraft fuel and aircraft noise and danger caused immediate vicinity of terminals. Top view shows double decker loading into pod to take it, lower deck shows crew's pod in mobile condition. Address: Battle Creek, Mich.

and 1 106A Chance Vought F8D, Convair CF-28, General 4-77 and non-520 Grumman 1100-5 series and main airplane Douglas DC-7.

All five detector assignment manufacturers agree that the military, particularly the Air Force, are showing a continuing interest in this value and reliability of photoconductive fire detection such as those being produced by Trucon Systems Electronics Corporation of Anaheim, and installed on the Lockheed C-130 Hercules.

Martin, Aerojet-General Plan Nuclear Projects

Two aircraft firms have received Atomic Energy Commission permits for nuclear projects.

Martin Nuclear Division will convert approximately 65 kg of uranium hexafluoride for processing into 50 kg of uranium dioxide. After fabricating into fuel elements, fuel will be used in a 1,000,000 kw. air transportable power plant Martin is developing.

Aerojet-General Nuclear, which per second ACN 100 training and research center with operations, will build three new reactors of this type.

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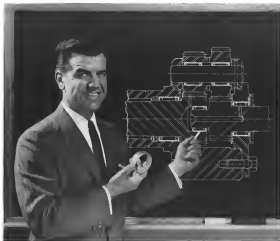
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Lockheed Aircraft Corporation
Burbank, California

California Division

Lockheed

Lockheed Aircraft Corporation
Burbank, California

Name _____
Field of engineering _____
Home Address _____
Home Phone _____
Where employed _____



"It's a perfect spot for a TORRINGTON NEEDLE BEARING!"

No one can spot a pointed needle bearing application as well as a Torrington engineer.

He will examine the unsolved requirements of our Engineering Department to give your product the unique advantages of the Torrington Needle Bearing. And he will draw on our extensive file of previous applications for ideas that may help solve your specific anti-friction bearing problems. You can rely on him, too, to review all engineering details so that the application will

go into production smoothly and perform satisfactorily in service.

If high rated load capacity, limited space or unit cost enter into your choice of a bearing, chances are you should consider a Torrington Needle Bearing. We may be able to add your product to the thousands which have enjoyed the benefits of this unique bearing.

See our New Needle Bearing Catalog in *Savel's Product Design File*—a work book for a catalog.

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend, Ind.

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TORRINGTON BEARINGS

Needle • Spherical Roller • Deep Groove Roller • Cylindrical Roller • Ball • Needle Bearings



CLARK EQUIPMENT CO. ground handling proposal (left) would use hydraulic cylinder to pull wheel onto tug. Other (right) uses ball latch attachment.

New Ideas Proposed for Jet Handling

Two new concepts of how to move 115-ton commercial jet transports between airports terminal and runway without engine use have been proposed to the airline industry.

Purpose is to cut down on noise and heat blast, also save large quantities of fuel jet engines use while jet transports taxi.

One proposal made by Clark Equipment Company (June 18, 1956, p. 102), would use several telescopic cylinders of driving the plane with a tractor, either with or without a regular tow bar. Two drivers are shown alone.

The other idea, suggested by a system officials of the Philadelphia International Airport, proposes use of inverted flat cars riding on standard railroad tracks to load the jets from terminal to runway. Among advantages claimed for the railroad system is that it

would "eliminate the need for construction of vast paved areas which jet giants otherwise will require." How the heavy planes will get to and from the flat cars is not explained.

Of the two low tug proposals made by Clark, two appear to be the most efficient.

One uses a hydraulic cylinder to pull the plane's nose wheel on to a low-ramp between the tug's two rear wheels, held it there during the towing operation, and return the nose wheel to the ground when the tractor is no longer needed.

The other uses a ball latch mounted on the rear deck of the tug which fits into a socket in the lower front part of the plane's landing. Both methods have the advantage of needing only a relatively light-weight tug since the nose gear's weight is applied to the tractor's

nose wheels to give the necessary traction.

Second method has the added advantage of not getting any accelerating or decelerating forces on the nose wheel strut. But it has the drawback of requiring a special socket built into the lower fuselage.

Two other Clark proposals include a tractor which also carries the nose wheel on a ramp straddling the nose wheels. However, the tractor is equipped with a track along track which steers the vehicle and increases maintenance maneuverability.

Other suggestion is to use a conventional type tug with tow bar. Disadvantage is the great weight required of the vehicle to move without traction for 150,000 lb. weight. Clark estimates that tug would require a drawbar pull of about 25,000 to 30,000 lb.

TORRINGTON NEEDLE BEARINGS Give you three benefits

- low coefficient of starting and running friction
- full complement of balls
- unequaled radial load capacity
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits use of larger and stiffer shafts



BOAL TRADE system would connect two dock terminal building jets with tractors in proposal of Philadelphia International Airport. Philadelphia Airport has 18,700-ft runway under construction for commercial jet traffic of 1968.

B.F. Goodrich report:



So hot that metal blisters, but hose doesn't melt

Problem: Guided missiles build up terrific heat as they streak through the sky at supersonic speeds. Heat that would blister ordinary metal, heat that would burn right through rubber!

A flexible hose is needed to handle the fuel that powers the missile. But the fuel is highly corrosive. Corrosion and heat!

What was done: B.F. Goodrich engineers used a new chemically produced material for the hose that stands both—and more. It stays strong and flexible at 300 degrees below zero as well as 450 degrees above.

The material, called "Teflon," has

the widest useful temperature range of any flexible material. It is reinforced with fibers of stainless steel wire for strength and is easily corrosion-resistant. The combination makes an especially light hose—it weighs less than half as much as regular aircraft hose.

Extra benefit: This hose is now filling its purpose perfectly in guided missiles, jet planes and rockets. And already inquiries are now being found for it in industry too.

Where to buy: Only two companies, B.F. Goodrich and Kinsinger Corp. make hose of a patented Kevlar-Kelco compound of Teflon.

For other types of B.F. Goodrich hoses, see your B.F. Goodrich distributor. As a factory-owned specialist in rubber products, he can answer your questions about all the rubber products B.F. Goodrich makes for industry. B.F. Goodrich Industrial Products Co., Dept. M-855, Akron 26, Ohio.



MAINTENANCE dock used by British Overseas Airways Corp. for Britannia overhaul in London is 18 ft high, 150 ft wide, 215 ft long. Facilities include telephone console with cockpit at 12 locations in dock, water system, high and low pressure air, ground air.

BOAC Dock Eases Work on Britannia



BOAC Britannia overhaul docks are fitted with power-operated lifts on both sides of each engine compartment. Lifts are controlled remotely so that mechanics can adjust height of working level without leaving the platform. Accessible to all areas of engine and nacelle is powered dolly.

Although dock, built of steel with oak wood flooring, is designed to handle Britannia 161, it also will handle larger Britannia 122. Dock is built from ground up, but overhead personnel are supported from the roof at only two points allowing complete free flow of movement of its overhead gantry crane to cover any position. Control center is on dock itself to save overhead walking.

Dock has three platforms on each side at vertical 164-166 ft. high with aircraft on rails to make all sections easily accessible.

NEW CONTINUOUS HIGHLY SELECTIVE,

Light, Simple System Overcomes False Alarming

ASHLAND, MASS. — Tubes, transistors, relays, and moving parts will give no trouble in Fenwal's new Continuous Over-Heat and Fire Detector, because the Detector uses none of these. The legs are not only out of it — they never were in it.

This radical improvement in continuous detection is a small, flexible, seamless tube filled with an inorganic compound, with a nickel wire at its center, and a control unit that reserves and amplifies electrical changes anywhere in the tube. Excessive heat anywhere along the tube lowers the resistance of the tube and promptly triggers an alarm.

The Detector can be called a radical improvement for a number of reasons, but the basic reason is that the *shut fiber* used by Fenwal gives such audibly sharp drops in resistance with rising temperatures that the length of the loop hardly matters. The temperature response of a one-foot length and a twenty-foot length of the Detector tube are usually within 10° F of each other!

In short — the highest of almost all precision continuous fire detectors, so-called *analog*, has been lifted. With that barrier broken, look at all the things Fenwal's new system can mean to aircraft safety!



compact, new — Contains no components subject to wear or breakdown. Not bothered by shock and vibration. No positive reaction. Hermetically-sealed. Weighs only 10 oz.

No longer do alarm systems have to be set to trigger at dangerously high temperatures in order to maximize false alarming. Set to give the alarm at resistively low temperatures, the Fenwal system will not false alarm, and will give a true alarm instantly — giving precious seconds for remedial action.

Wide-spread fire or over-heat conditions and localized hot spots trigger alarms at virtually identical temperatures.

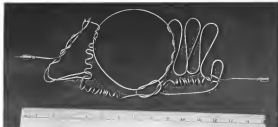
Aircraft can now have confidence in over-heat detection that is,

in effect, a network of spot detectors, monitoring a widely varying series of temperature situations. Lengths of sensing tube, each set to trigger the alarm at a different temperature, can be joined in a single loop, without one segment's affecting the performance of any other segment.

Fenwal has developed and tested exhaustively a large family of detectors for service over a range from 350° F to 2000° F.

The reliability and durability is due, in large measure, to the novel design of the control unit. The unit,

FIRE DETECTOR RELIABLE, ACCURATE



SELECTIVE, ACCURATE DETECTOR — Its flexibility can be bent into any shape. Extremely low impedance virtually eliminates resistance-fire detection lagtime of false alarming.

small enough to fit in the palm of a hand, is a hermetically-sealed monocrystalline amplifier which, when the alarm temperature is reached, amplifies the changes occurring in the detector loop and actuates alarms. It is light, tough, and not in the least positive attractive.

Write for full details to Fenwal Incorporated, Aviation Products Division, 134 Pleasant Street, Ashland, Massachusetts.

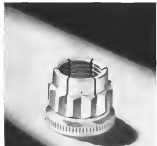


Controls Temperature
... Precisely



WIRING IS VITAL — Make-up of detection loop (mounted on right panel) is tested with flame, demonstrating conclusively that it triggers alarm at same temperature despite variable ambient temperatures along loop and regardless of the length of loop exposed.

NEW—SPS 119 FW aircraft locknut for applications up to 1200°F



NEW SPS 119 FW selflocking nut is made of corrosion and heat-resistant alloy, silver plated. It incorporates the unique SPS Patented self-locking feature, which locks the nut securely in place without secondary locking devices. These nuts are precision manufactured to Class 1B fit.

SPECIFICATIONS

Size	A	B	W	
			max	min
1/8-20	375	500	313	304
1/4-28	420	606	376	367
3/8-24	500	683	439	430
1/2-20	593	800	502	493
5/8-24	687	910	584	575
3/4-20	760	1004	657	648

Standard sizes range from #10 to 1 1/2 in. diameter. Offer SPS lock features where aircraft locknuts are available in larger sizes. Write for details.

Critical components operating under high temperatures in jet engines—in manifolds, afterburners and similar hot spots—cannot be kept fastened with ordinary locknuts. In high temperatures, such nuts soften and fail from loss of tensile strength. They also seize after cooling. Often removal of the nuts can then be so difficult that the parts they hold together are damaged in disassembly.

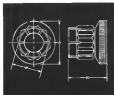
SPS 119 FW high temperature locknuts were designed to end such problems. Made of corrosion and heat-resistant alloys, and silver plated to meet specifications, they retain their high tensile strength at temperatures up to 1200°F. And they withstand hundreds of cycles of heating and cooling without galling or seizing on mating threads.

For complete information about SPS 119 FW 1200°F locknuts or the complete line of standard SPS threaded aircraft fasteners, or for assistance with your special aircraft threaded fastener problem, write to today Aircraft Products Division, STANDARD FASTENER STEEL CO., Ardmore, Pa.

AIRCRAFT PRODUCTS DIVISION

STANDARD FASTENER STEEL CO.

SPS
ARDMORE, PENNSYLVANIA



Tractor Developed to Tow Nuclear NB-36

An aircraft tractor to tow USAF's nuclear test aircraft, the Convair NB-36, has been developed by the American Coleman Co. of Littleton, Colo. It has a driver's cab completely shielded against nuclear radiation.

Coleman and its tractor "to still the only aircraft towing tractor built for the purpose of towing aircraft which are carrying nuclear ordnance."

A 3,600 lb. one-man cab is the special feature of the tractor.

Cab is constructed of cast and plate steel 3/8 in. thick and has windows that are 75% pure lead of the same thickness.

All cab openings are sealed with rings for sealing perfection. The single door is built like a vault door. From outside it is closed and either locked or sealed as it opens the cab.

Even protection has been taken to protect the driver from nuclear radiation.

A. Twiss, (General Electric) is due to test the tractor for steering and going instructions.

Tractor weighs 25,650 lb. and has a top speed of 23 mph. Tractor's diesel pull is sufficient for towing the heaviest aircraft. It has four-wheel drive.



TRACTOR developed to tow Air Force's NB-36 nuclear test aircraft has driver's cab completely shielding against radiation. Single operator controls vehicle.

and four-wheel drive, with the rear wheels steered independently from the front to provide maximum maneuverability.

Mark Twain has proved under drive controls are used on both sides and in the transfer case.

It is powered by Chevrolet V-8 engine, Chevrolet industrial engine control and Clark transmission.

Tires are Goodyear 34 X 30, 20, 16 psi.

All Weather tread. Steering gear and hydraulic valves are made by Ross Gear and Tool Co.

10-double steering pump is produced by Vickers Inc.

Coleman officials said the vehicle was made to tow the USAF nuclear test aircraft (NB-36) and perform other operations at the USAF Nuclear Aircraft Research Facility located at Fort Worth, Tex.

Aircraft: Wire's Who Reports

A cross section of the Wire Who in the aircraft industry—including Douglas, Allison, Fairchild, Grumman, Martin, Republic, Cessna, and Pratt & Whitney among a host of others—is reported to have reduced engine wiring time as much as 60%. The saving is effected by the use of the new Robinson Wire Twister, an improved model of the ones that have been service with the army, navy and aviation since 1945. Improvements include the exclusive diagonal jaw design that permits easier access to hard-to-reach areas, and clamps a wire like grip as the wire is pulled in over a 36° bend thus delivering added leverage for twisting.

In addition to the greatly increased engine wiring speed, users attest to improved shop safety—fewer skinned knuckles and burned fingers.

Besides their production line measurements, Robinson Wire Twister readily adapts to the shop to bench work, on radio and radar equipment, on engine, carburetors, instruments and sub-assembly work of all kinds.

List price is \$85.00. Write for fully descriptive literature to Ralph C. Robinson Company, Dept. W, Box 3374, 2516 Crosby Way, North Sacramento 15, California.



... saves
2/3 the usual
wiring costs



the ROBINSON
—wire twister



Douglas A-1D Skyraiders taking on fuel from A-1D tanker

FLIGHT REFUELING, INC. PROBE AND DROGUE EQUIPMENT EXTENDS RANGE OF NAVY'S A-1D

Douglas A-1D tanker to A-1D receiver in the order of the day when the Navy's largest carrier-based aircraft display their new refueling capability, made possible by refueling equipment designed and manufactured by Flight Refueling, Inc.

Converting some of the swiftest Douglas A-1D Skyraiders to tanker planes provides the Navy with high-performance, high-capacity, carrier-based aerial tankers to extend the range and effectiveness of the jet fighters and fighter-bombers of the Fleet.

The adaptability of the Flight Refueling, Inc. Probe and Drogue aerial refueling system to installation in fighter type aircraft is just one of the many advantages of this system which is also in extensive use with the U.S. Air Force. Lightweight and compact in design, the Probe and

Drogue system is virtually automatic, requires no highly trained operators.

Development and manufacture of aerial refueling systems is only one aspect of Flight Refueling's activities. Our thorough knowledge and experience in handling fuels under the most difficult conditions have led naturally to undertaking many fuel handling problems including aircraft fuel systems, ground handling equipment, fast refueling of ground vehicles and transfer of a variety of fuels for missiles.

For any problem involving the handling or transfer of gases or liquid fuels, look to Flight Refueling. A thoroughly experienced, highly capable engineering staff is at your service, backed by unique fuel systems test laboratories and manufacturing facilities.



Miniature Substation Goes Into Snark

A new, experimental electrical substation was recently put into service on Northrop's SM-62 Snark intercontinental guided missile. The substation must transfer 58 electrical circuits and 7 signal circuits from ground line power to airborne power in 24 sec.

The device is operated by remote ground control and provides automatic on-deck operation by making aircraft contact before hooking ground contact, to assure a steady, constant power supply. The maker, Cole Electric Co., says that it eliminates all relays, contacts and vacuum tubes for maximum efficiency and reliability.

The device, which weighs 35 lb. and is 17 1/2 in. long, 5 in. wide and 5 1/2 in. high, was patented after large industrial installations that weigh several hundred pounds. It uses weight in the Snark by eliminating all previously installed airborne check-out circuits and equipment.

Current draw is 5 1/2 amps, 38 v. for 24 seconds maximum. It provides 58 connections for 400 volts a.c., 22 circuits for d.c. circuits plus 7 signal circuits, all single pole double throw. Address: 4439 Steller Drive, Cedar City, Calif.

British Firm Develops New Tooling Methods

London—Impress of tooling and methods of manufacturing precision tubes, developed by a British company, are allowing valuable savings and producing finished products to close limits.

A precision tube, when of special section, takes the place of a casting or forging in the hot extruded. Instead of being machined at a heat-treated, forged, tapered, reduced, or segmented to give it several other operations to produce the required final shape.

Among the orders being executed by Aches & Pollock Co., of Chalfont are some for the Harland Propellers Co.

Ltd., Hatfield. Others include motor blocks for the 14-in. gas turbine helicopter and the Saunders-Roe Skeeter army reconnaissance helicopter.

Propeller cone tubes for the Bristol land use of metal-clastic metal-bonded steel. The finished cone tubes used to be 100 in. long and weigh 7 in. in diameter. Inside and outside diameters are not constant for the whole length and varying rates of taper are specified. Both physical dimensions and mechanical properties have to be extremely closely controlled.

In practice, a similar result is made using brass the solid metal coil for large machine tools, a good deal of skilled labor and time, besides resulting in a relatively high proportion of scrap from machining operations. The new techniques enable all machining to be confined to a hot cast-in-in long and the use of smaller machines, resulting in saving of time and materials.

OFF THE LINE

► American Lufthansa Corp. has been awarded a \$6,951,000 Air Force contract for an unspecified number of Model D-118 trucks, fire and rescue trucks. The vehicles weigh 11,000 lb. and can deliver 7,000 gal. of aviation fuel. They have a speed of over 60 mph.

► Million dollar laboratory devoted entirely to engineering research and de-



Advanced Synchrophaser

This is an advanced synchrophaser synchrophaser unit developed by Hamilton Standard Division of United Aircraft Corp. It features seven pentode wave phasing units using copper glass in heat-treated aluminum shells for correct synchronization and rugged wet-vacuum vacuum tubes. All vacuum pentodes and phasing units can be removed and replaced in 3 minutes.

development of guns, gun flight instruments and navigation and observation systems is being built at Norwood, Mass., by The Control Engineering Unit, Detroit Controls Corp., division of American Standard. Called Plant No. 1, the building will be completely equipped for model making, testing and plant production.

► Petro-Engineering Service, a new, cost-effective cost fuel service, is being supplied by Gulf Oil Corp. for industrial and commercial users of petroleum products. The program is limited to 1,500 service stations and technicians and



Runway Cleaner

This Indian-made runway cleaner (AW Sec. 10, p. 87) has been made under license under making with public. Powered electrohydraulics pick up air from ahead of the runway. The cleaner, which weighs 100 tons, was developed by Wright Air Development Center, "on task to clean the run of better airports," according to the manufacturer. Robert of Geneva Machine was the first to buy engines. Over three weeks the other parts of the machine arrived. A separate generator feeds the electrohydraulics. The machine can clean at speeds from 1.25 mph and has a top speed of over 15 mph. A set of air filters will not let dirt collected while leaves debris in clumps into large lumps. Filters are automatically cleaned each time the lumps are dropped. All controls are behind the operator and are by means of a single operator.

ATTENTION ENGINEERS

Unusual stress opportunities for engineering personnel are available in new projects for developing new refueling systems.

Write Engineering Manager for details



Flight Refueling, Inc.

FRIENDSHIP INTERNATIONAL AIRPORT Bellmead 5, Maryland

WEST COAST REPRESENTATIVES

William E. Davis, P.O. Box 412, Inglewood, California

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Robert L. Mayhew, 6150 Sunset Hill Road, Dayton 5, Ohio

CAPABILITIES . . . Manpower, Tools and Experience



BEECH BUILDS	
	MA-3 MULTI-PURPOSE VEHICLES
	C-19 MA-3 POWER UNITS
	T-44 MA-3 MULTI-PURPOSE VEHICLES
	B-17 BOMBER
	B-24 BOMBER
	B-29 BOMBER
	B-50 BOMBER
	B-57 BOMBER
	B-58 BOMBER
	B-59 BOMBER
	B-60 BOMBER
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	B-98 BOMBER
	B-99 BOMBER
	B-100 BOMBER

No other ground support unit offers the complete flexibility and "fair wearing" action of the Beechcraft MA-3 Multi-Purpose Vehicle, now entering service with the U. S. Air Force.

The MA-3 has 12,500 pounds draw bar pull for towing aircraft, which can be increased by adding to its gross weight. It has re-circulating and gas turbine power plants, an air cycle type air conditioner of 15-ton capacity, high pressure air compressor with capacity of 15 CFM of free air at pressures up to 3500 PSI. The vehicle can travel at 45 mph, maneuvers easily, has four-wheel power steering, four-wheel drive and four-speed torque converter transmission (four speeds forward and two reverse).

The MA-3 provides 24 Kilowatts direct current from two self-cooled 500 ampere 28-volt generators; features split and single bus, has three-phase alternating current 60 KVA 45 KW; and a self-cooled alternator, precisely controlled frequency 400 CPS.

Unexcelled in-the-field service by thousands of Beechcraft ground power units and a world-wide service organization add to the advantages of this truly exceptional unit.

Inquiries from airlines, manufacturers, and others who desire details of the most advanced and modern ground support unit will be welcomed by the Contract Administration Division, Beech Aircraft Corporation, Wichita 1, Kansas.

Beechcraft

BEECH AIRCRAFT CORPORATION, WICHITA, KANSAS, U. S. A.



DASSAULT SuperMystere (left) shown as being produced at rate of three per month. Others here are Ouragan (middle) and Mystere IV (background).

Dassault Builds Mystere, Ouragan at Merignac Plant



DASSAULT plant at Merignac was this close to producing Mystere IV A, Ouragan and SuperMystere. Close-up of SuperMystere on production line (center) shows "North American look" characteristic of many current European fighters. Full production rate of 12 per month will be reached by end of year. Some seven miles to left western front leaving track to right. SuperMystere has exceeded Mach 2 in level flight without afterburner. Ouragan and Mystere IV A are being built for Indian Air Force (left). Markings on fuselage.



UNDERBELL SOCKETS fitted in this Howard Super Ventura make give 1,800 lb. thrust as desired in event of emergencies.

Executive Ventura Has 300 mph. Speed

San Antonio, Tex.—Motor fueling of the surplus World War II Lockheed Ventura PV-1 patrol bomber into a 300 mph plus executive transport has been the major factor in building a fixed base operator's annual income to an anticipated \$5 million this year. Of this income, delivery of its new, best-in-class plane is expected to account for \$5 million.

Howard Aero, Inc.'s Manufacturing Division, at San Antonio International Airport, presently expects to build at least 60 of these new ventures, which it calls the Super Ventura. Initially it had 25 Ventura airplanes it is expecting to deliver another 21 in South Africa. Howard is also studying the application of turbine power to future, business transport among other projects it has in mind. But no firm decisions have been reached on these plans. Arrivals Week was held.

In Super Ventura is now operated by 16 U.S. corporations and has been ordered by another 11 companies.

First production Super Ventura was delivered to Copaco Oil Co., Vietnam,

Tex., in May 1956. Other plumes delivered last year went to National Steel Corp., Republic Steel Corp., Triangle Conduit & Cable Co., Gulf Oil Corp., Fireboard, Traveler Co., Youngtown Sheet & Tube Co. and Corbitt Skaggs, Inc.

Super Ventura version of the Lockheed transport can cruise at 300 mph over a 2,600 mi. range causing a full load and still retain ample reserves. Gross weight is 55,000 lb. and cruise weight is 14,000 lb.

Longer Range

At lower cruise speeds, the Super Ventura's range can be extended to 3,000 mi. It has an intermediate stop distance of 4,717 ft. in a landing gear down at 2,520 ft. and a take-off distance of 2,530 ft.

Howard chose the Ventura for its modification program after considering several other models, including the Lodestar and the A-26. The Ventura was picked because it fits into the 75,000 to 75,000 lb. weight class Howard wanted, and because it has a structure

which will permit speeds over 300 mph. The Ventura has a fuselage structure that Howard really needs for the Super Ventura. That the company points out that the aircraft is designed for a red line cruise speed of 350 mph. Thus, the Super Ventura has a considerable safety factor between its normal cruise speed and the design and load.

Ventura developed a full reputation as an emergency aircraft in which to use as a cargo during tactical Howard is equipped and armed that while the aircraft indicate the Ventura's reputation is worse than it deserves, the cost problems would have to be solved in order to make the aircraft sale.

Two modifications contributed to the solution. First, a spring leg based on tail section was installed, reducing by 70% the pressure required by a pilot to control the Ventura during an emergency.

Boost System

Howard's boost system isn't subject to electrical or hydraulic failure, adding a safety factor to the aircraft's overall system.

Second modification was a simple structural change. Fuelage was cut at the first frame aft of the wing's trailing edge, and a 45 in. gap was inserted. This extensive gap left tail surfaces on a larger level arm and moves them farther from the prop blast, thus contributing to the stability of the airplane.

Along with the aircraft name improvement work, the first fuel gap in the fuselage gives the Ventura a cozier cabin. But Howard's manufacturing chief, Leslie Carr, describes this as a by-product of a change made primarily for aerodynamic reasons.

A change which solved tail buffeting problems was the addition of a new,

thicker trailing edge to the wing. The new edge stops the flow 1 in. from the former 3/4 in. position, deflecting prop blast and reducing buffeting.

A waste oiling point on the Super Ventura is the new fuel system designed by Howard.

All carburetor-type tanks are removed from the fuselage, and the 1,300 gal. of fuel are stored in integral tanks in the wings—in a forward and one outboard of each engine.

Fuel system in the Super Ventura is completely flexible, and all fuel is available to either engine without the use of a cross-feed system. Fuel arrangement is simplified by the fact that the tanks are located near the center of gravity and this can be used to its own with little concern for weight distribution.

Fuel-Feed System

System includes a fuel-air automatic carburetor, isolates that is entirely separate from the main fuel system. When a malfunction occurs, the carburetor isolates give engine operation without risk.

Howard built the Super Ventura as an eight-stage production line that currently takes about eight months to produce a finished product. Certainly the line turns out an airplane every 20 days, but this schedule will soon be extended to one every three weeks.

Before production starts, the unit has a Ventura on, disassembled and stripped. Most of the materials have less than 500 lb. on them.

In the second step, the Ventura gets a complete 3,000 lb. overhaul. The aircraft is released where necessary, then it moves on and a cut and the fuselage gap is installed.

An overhauled landing gear is installed next. The Super Ventura uses PV-2 gear because it is heavier than PV-1 gear and has fewer added joints. It built and looks like the same on both aircraft.

Shallow bomb bays beneath the cabin floor are rebuilt into two big 540 compartments.

Since the Ventura has a banner, it has the fuselage windows. This allows the customer to get his own window arrangement, and Howard allows him considerable flexibility, including removal of most windows. Cockpit windows are refracted and fitted with a curved bird proof, safety glass windshield.

Control system is completely redesigned by Howard, and control cables are released under the cabin floor instead of running along the fuselage wall as they do in the Ventura.

Much of the Super Ventura's elevator operation is where in the nose, and the fuselage in the nose section is beefed up. A corrugated aluminum

Howard Super Ventura

SPECIFICATIONS

Max. Gross Weight	55,000 lb.	11,000 lb.
Fuel Capacity	1,300 gal.	52 gal.
Oil Capacity	52 gal.	52 gal.
Engines & Propeller Type (Standard)	Part 2 & Wherry B200-15A1118 with Hamilton Standard 230-56 601A-1-5 Propeller	
Takeoff Power for 5 min.—Sea Level to 4,500 ft.	2,000 hp	
MEIO Power—Sea Level to 3,100 ft.	1,700 hp	
Engines & Propeller Type (Optional)	Part 1 & Wherry CB-16 with Hamilton Standard 241-50 7057-50 Propeller	
Takeoff Power (5 min) with water—Sea Level to 3,000 ft.	2,400 hp	
MEIO Power—Sea Level to 3,000 ft.	1,800 hp	

PERFORMANCE

Stall Speed at 10,000 ft.	25,000 ft.	28,000 ft.
Stall Up	130 ft. mph	115 ft. mph
Flaps 20%	102 ft. mph	101 ft. mph
Flaps 200%	87 ft. mph	90 ft. mph
Takeoff Speed V	125 mph	135 mph
Speed of Minimum Controlability V _{min}	100 mph	100 mph
Final Approach Speed	114 mph	107 mph
Landing Speed	103 mph	100 mph

* Note: All Speeds Given Are Indicated Air Speeds.

Single Engine Range of Climb (With CB-16, 2,400 hp, Takeoff 1,700 hp, MEIO, All JATO Performance Compared) 26,000 ft. 25,000 ft.

FIRST SEGMENT (GEAR DOWN)

Sea Level	917 ft. mph	101 ft. mph
With JATO	1,290 ft. mph	106 ft. mph
4,000 ft.	1,444 ft. mph	103 ft. mph
With JATO	1,490 ft. mph	104 ft. mph

THIRD SEGMENT (GEAR UP)

Sea Level	799 ft. mph	413 ft. mph
With JATO	3,550 ft. mph	1,093 ft. mph
4,000 ft.	670 ft. mph	324 ft. mph
With JATO	3,933 ft. mph	1,000 ft. mph

EN ROUTE

Sea Level	642 ft. mph	407 ft. mph
5,000 ft.	102 ft. mph	315 ft. mph
9,000 ft.	159 ft. mph	330 ft. mph

Single Engine Rate of Climb (With CB-16, 2,400 hp, Takeoff 1,700 hp, MEIO) 38,000 ft. 26,000 ft.

FIRST SEGMENT (GEAR DOWN)

Sea Level	963 ft. mph	562 ft. mph
4,000 ft.	1,010 ft. mph	450 ft. mph

THIRD SEGMENT (GEAR UP)

Sea Level	1,170 ft. mph	558 ft. mph
4,000 ft.	1,090 ft. mph	701 ft. mph

EN ROUTE

Sea Level	796 ft. mph	505 ft. mph
1,000 ft.	635 ft. mph	465 ft. mph
5,000 ft.	307 ft. mph	350 ft. mph

Cross Performance: 30,000 ft. & above
Range at 10,000 ft. Plus 45 min. Reserve

300 mph	2,000 mi.	
250 mph	2,200 mi.	
200 mph	2,400 mi.	
150 mph	5,000 mi.	



PICTURE windows in a variety of arrangements can be fitted to Super Ventura conversion.



NEW PANEL to customer's specifications is an important part of Vertica modernization.



NEW INTERIOR, costing \$10,000-\$15,000, provides comfortable work area on long flights.

panel is installed in the fuselage near the passenger area, but to act as a second dashboard and to reduce vibration.

Engine modifications and upgrades are standardized and modified to receive modern J&W R2800 engines installed on the Super Vertica. The military Vertica was equipped with an early version of the R2390 engine.

Engine Choice

Most Super Vertica producers have ordered the airplane with Pratt & Whitney R2800-15 AM110 engines and Hamilton Standard 27E-20-085A V45 propellers. But Howard has also sold

the aircraft with more powerful R2800 CR16 engines equipped with Hamilton Standard 24E-20-7017-38 props.

Majority of the aircraft have been ordered with standard Howard uses a McMillan radome that is heavy enough to take speeds near 700 mph, and the company uses a Cessna fuel pump that can be color-coded with fueling ports and will protect the radome for up to 100 hr.

Super Vertica customers have also begun to order radar transponders for their aircraft. Howard has sold them for three aircraft so far.

Cost of the Super Vertica equipped

with R2800-85 AM110 engines is \$296,580. Equipped with the R2390 CR16 engines, the aircraft costs \$355,525. In addition to the basic price, other interiors cost \$30,000 to \$15,000.

Another \$57,000 to \$100,000 is added for electronic equipment depending on what is ordered. With present electronic equipment being made, most orders are running close to the \$110,000 mark.

Customers are given time to grow along the Super Vertica but Howard expects the idea. The company feels that the project would take too long and be too expensive to be either reasonable or practical.

Certification Decision

Some decisions were made on certifying the Super Vertica under Part 4B of the Civil Air Regulations. The aircraft meets 40 requirements. Howard states, but the company doesn't feel it is necessary to spend \$400,000 to certify a under 4B.

Last December a Super Vertica nearly crashed on a training flight in weather conditions. On several occasions the pilot's lack of experience with the airplane may have been a big factor in the accident.

Howard confirms that the Youngstown pilot, a veteran pilot, left his aircraft without any dual check flight time. He had made one landing and didn't have a type rating for the aircraft. Weather defied the flight test program, and the pilot was unable to return home. The aircraft had been delivered and the decision to go was made by the pilot's own.

This situation was contrary to Howard's usual training program for pilots. Normally, pilots have 10 to 20 hr of check time before they fly, even depending on their previous experience. Howard advises a minimum of 10 hours, but the company will provide or even hours of training in a pilot's lack of necessary.

January Plane Exports Up 46.8% in Value

Number of U. S. business and utility aircraft of 6,880 lbs. maximum weight or less in January totaled 85, four less than the same month last year, but dollar volume represented an increase of 46.5% over last year for a total of \$8,392,441 compared with \$586,951.

Five manufacturers—Aero Design Boech, Crown Piper and Taylorcraft—shipped more to 19 foreign countries: Alaska and Puerto Rico. The latter two took eight and two aircraft respectively. Other shipments by date nation: Argentina 28, Belgium Congo 1, Belgium 7, Brazil 2, Canada 17, Chile

New Cessna YH-41

"delivers" top performance

plus big maintenance savings

to helicopter flying!

Cessna's all-new YH-41, recently purchased by the U. S. Army for its air "arm," combines the latest in design and engineering advances to give operating and maintenance performance never before experienced in the helicopter field!

For example, the engine—mounted in the nose of the fuselage—makes installation and servicing easy, provides extra cargo or passenger space. Cessna has made the rotor assembly aerodynamically clean. Also, the drive system on the new YH-41 is a masterpiece of simplicity, has a minimum of parts—conveniently located for easy servicing.



Offering multi-utility uses, the 4-place YH-41, at 2,000 lbs. gross weight, can climb higher, faster than any other helicopter in its class—sea level to 10,000 ft. in less than 12 minutes! Its speed is the fastest in the light helicopter field.

CESSNA AIRCRAFT CO., WICHITA, KANSAS

do you use
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relays?



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Shown in the chart are typical ranges available in these units. Special ranges frequently can be supplied to meet specific requirements.

A.W. HAYDON Company
132 NORTH SUN STREET, WATKINSVILLE, GEORGIA
Design and Manufacture of Shock-Mounted Timing Devices
PROVED WATER PERFORMANCE IS PARAMOUNT.

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do you require **MECHANICAL SEALING?**
do you require **NO PROBLEM** for the
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do you require **ADAPTABILITY?**
do you require **MECHANICAL SEALING?**
do you require **NO PROBLEM** for the
A. W. HAYDON Company

business plane water, which also includes a DC-1. The light rain was recently used to C-60 to check flood damage along its perimeter in eastern Kentucky and southeast West Virginia. The C-60 fleet is operated by Capital Airlines under contract.

Loading strips can be fabricated on firm storage, set mode under the Department of Agriculture's 3-10 year construction reserve program on the three-year annual storage reserve. As long as the loading strips are used for non-commercial purposes, the owner of the property may still get full back payments for placing the land in reserve.

Design firm, attributed to electrical sheet circuit, destroyed William Felt's budget over "Reich" in addition to his other private aircraft at Warwick, August, N. Y. Hanger and plane are now fully insured.

First 16 Rockwell-built Teller S-37 single-engine trainers were delivered to the Brazilian air force.

Radiocarbon substitution for Twin Beech D1N and E15 for use with new light-weight aircraft, such as BGA AVQ-92, is offered by Chamberlain Aviation Corp., Alton, Ohio. The modified Beechcraft airframe contains twin radiocarbon is tagged for access to the equipment.

Downers of aircraft using Research Model-2000, populating, the 17-100, Locomotive 0200 D2, are added to the manufacturer that the populating should be considered if it can ever 500 or so on the way to the top. Research will allow 5105 on the old prop in exchange.

Two hangars to house business planes up through Cessna 620 and Villiers Vincent are set under construction by Laker Air Services, Port Coleraine, Ohio. The Duesen-Idan structures will measure 142 ft. x 128 ft. and 172 ft. x 96 ft. Leasing and equipment office are also provided. Late next business year 40 business and private aircraft.

Second and third Beech 95 Travel Air light twin units are entering completion. Experimental work in second production in the new business plane, primarily with engine arrangement, late entered the critical nose levels to about half in the least tests and three quarters in the air tests, according to Beech. Test production Travel Air should be off the line in late spring.



Northrop Executives Use Bell Helicopter

New Bell 412 Ranger low-price helicopter is being used by Northrop Aircraft Inc. to expedite travel of executives and high priority mail at its Southern California plant. William Collins (left), Northrop president and C. H. Miller, vice president, are shown arriving at the firm's main plant at Hawthorne Municipal Airport. Northrop reports the Ranger is showing level line, low and ground from Hawthorne to its Anaheim Division in 22 min. in its helicopter subunit, at Van Nuys from an hour to 15 min. Lightest prop, also carried, Northrop's business aircraft that includes a DC-1 operated on a scheduled basis between Bell center and Edwards AFB and a Twin Beech 35. The helicopter also is available for rescue work.

U. S. BUSINESS & UTILITY AIRCRAFT SHIPMENTS

January 1967		
Make and Model	Aircraft	Builder's Net Billing Price
	January	January
Aero Design 301 A	1	\$1,414,000
	10	
Beech 22 Bonanza	41	
20 Turbo-Bonanza	3	3,048,221
10 Executive	11	
Cessna 441	5	12,000
Cessna 170B	4	
172	30	
180	20	3,440,000
182	11	
310	10	
Champion 170C Traveler	14	30,745
Columbia C-1 Winnebago	2	10,800
Grumman 1190	1	18,000
Hawkeye 400	4	41,000
Boeing 727-200	30	3,245,472
Boeing 737-400	10	
Boeing 747-200	1	
Boeing 747-300	1	
Boeing 747-400	1	
Boeing 747-500	1	
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Boeing 747-38		

JOHNNIE MARTIN,
ONE OF AMERICA'S
VETERAN TEST PILOTS
SALUTES
COMMANDER 680 SUPER

Performance



"We find in the Aero Commander 680 Super the highest cruising speeds coupled with low maintenance costs plus excellent stability and control, especially in the approach and landing configuration, making this airplane a dream come true to all pilots who fly it."

Johnnie Martin

J. F. "Johnnie" Martin, assistant director of Flight Test

for Douglas Aircraft Company is recognized as one of the nation's outstanding test pilots. From his first solo flight, back in 1927, Johnnie's life has been a continuing experience in flying and testing airplanes. As the Douglas test pilot, he tests all types of aircraft, including the recent holding "Skyhawk" and "Skyrocket".

He was chief pilot for Douglas before being elevated to his present position.

AERO

Commander



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ing of the Institute of Aeronautical Sciences, Stanford, Cal.

Antigravity, in the sense of devers wheels, equidistant to document the pull of gravity is not the question of the case, the vice president of the Martin Co. puts forth subsidiary and incident who talk of levitation (which don't appreciate that we have only a partial understanding of the mechanism of gravity).

Under more other fields where this two engaging techniques are being applied with continuing success, Bender indicated that the understanding and control of gravity phenomena can take the whole career of dedicated scientists of the Newton and Einstein broad before the breakthrough has been had so that the problem can be defined and attacked by experiment.

As RIAS, less than a half-dozen scientists are backing away at our "law of gravity ignorance." They are talking such questions as:

• Is Einstein's concept of the curvature of light under gravitational fields correct or is there gravitational radiation?

• Is gravitational mass really the same as inertial mass?

RIAS researchers would like to extend the general theory of Einstein down to explain the particle actions now handled in quantum mechanics. RIAS experiments would like to redo certain experiments in the laboratory which formerly have only been performed on the orbital or astronomical scale. Particularly, they would like to determine the red shift in light waves as they are influenced by increasing gravitational fields. This is a measure of how light slows down as the strength of the gravitational field increases.

The problem with gravitational experiments is the laboratory is that the gravity forces are so very much smaller than the other electrostatic and magnetic forces that they are almost impossible to detect. RIAS scientists are hoping that they can use atomic clock time standards with accuracies of one part in 10¹².

RIAS, Bender explained, has been the Martin Co.'s way of implementing its conviction that our greatest need tomorrow really lies in research. RIAS hopes to make research "at the Einstein level" especially attractive to gifted scientists.

Martin has no direct intention of going from RIAS and Bender. RIAS is as open to air within company as it is to Martin. Martin hopes that RIAS will serve as an example and that there will soon be this sort of research period in a national level.

Although Martin does not plan for profit from RIAS, it does hope that the cost of its operation will be offset by government research contracts.

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WELDING PROGRESS REPORT

Leading Aircraft Subcontractor Proves Job Shop Economy of Sciaky Counter Weld Control

Electronic Welding Company of Los Angeles, California, has now completed over eight months' production experience with the new Sciaky Professional Electronic Counter Controlled Resistance Welder. Their experience proves that the advantages of the new Sciaky welder already proved in high production service apply equally to "job shop" requirements.

Ease of Set-Up Is a Key Factor

Mr. George Palmer, President of Electronic Welding Company, sums up his experience when he says, "The new Sciaky welder control gives us a definite advantage over the A.C. issue. We've got reduced cost of developing and repairing weld defects, including those requiring rework in accordance with MilSpec."

Versatility is Vital for Job Shop Operators

The versatility of the Sciaky Professional Electronic Counter Controlled Welder makes it the logical answer to Electronic Welding Company's requirements. Simply set-up guarantees the need for hard-to-get skilled labor. Its suitability for aluminum, steel, stainless, jet engine alloy, brass, etc., makes practical the use of the machine on both aircraft and non-aircraft work.

At Electronic Welding Company, a single Sciaky welder welds and inspects the F-57 program and the airframe structure on the F-104 and F-52 programs. Current output is two ton force (1000 lbs.) per day.

Mr. Palmer states that "having a Sciaky Professional Electronic Counter Controlled Welder is as near prerequisite to getting subcontract from aircraft and jet engine manufacturers and airlines as

tractors as well as from commercial manufacturers who require the high set standards of weld safety and economy."

To prove his confidence, Mr. Palmer has placed orders for two more of the new Sciaky Welders. One is a spot welder, the other a seam welder.

Production Advantages

Important to all who require safe, economical welds is the precise control provided by the new Sciaky Welder. When report that they get

precisely what they set on the welder. The machine cannot deviate from an setting and it is consistent throughout the entire range of adjustment.

Another advantage is the simplicity of maintenance. Plug-in subassembly control units make it possible to replace a unit in a matter of minutes. Further, the plug-in features hastens any addition of additional features if they are ever required.

Literature Available

Technical bulletins completely describing the new Sciaky Professional Electronic Counter Weld Control are available. Write on your company letterhead requesting bulletins 335 and 339. There is no obligation.



ELECTRONIC WELDING COMPANY's new Sciaky Counter Control Welder. It is shown here welding an aluminum bar for the Pratt & Whitney F-57 jet engine. Note the production use of a 30-amp resistance welding unit.

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Sciaky Bros., Inc., 4925 West 67th Street, Chicago 38, Ill., Portsmouth 7-5600

SCIAYK

Throttle Linkage Suspected in PV Crash

A Lockheed PV-1, N 44801, crashed and burned by the Chase Company, crashed near Jeffersonville, Indiana, on May 11, 1956, about 1915'. All eight occupants—on passengers and two pilots—were killed and the aircraft was destroyed by impact. The did not follow.

HISTORY OF THE FLIGHT

The flight was for the purpose of testing the new Chase aircraft, the Chase, flown, in Louisville, Kentucky, in about a 10-minute cruise.

Departing from Chase, the Chase was instructed to fly on a VFR flight plan (changed to IFR) with the Chase Company's Chief Pilot, Randolph A. Mallon, as co-pilot, and Robert H. Babbitt, also a Chase pilot, as copilot. Chase eight again departed was estimated to be 7,500 pounds (the maximum permissible gross weight was 11,000 pounds).

Shortly after takeoff, the pilot gave a status report to Chase radio of his time at 0700 and his estimated descent flight time in one hour and 20 minutes.

He did not report weather information at that time. Other conditions indicated in the flight prepared the final one hour at 1200 over the Jeffersonville area.

As approach was then started late that point in the Standard August 4th radio delay. During the approach the aircraft struck trees and crashed at a point one-half mile south of the Jeffersonville intersection. The aircraft, which was estimated No 1 ILS approach for Standard August 4th crash on (crashed).

INVESTIGATION

From the Jeffersonville meteorologist in Standard August, the crash at 700 degrees. The direction of impact was about 175 degrees, the crash angle was 45 degrees below the horizontal, just below the ground the aircraft was through trees and then crashed, south of an eight mile, the impact was about 15 feet from the (The spot of the crash is 875 feet). A large open field was directly south.

Support and distribution of the wreckage indicated that the aircraft had crashed the ground on its right wing and side, continuing from the same side, the left wing. Both engine was lost. The right engine, however, was not damaged by impact, debris from its stall made ground and came to rest adjacent to the left engine.

Practically all wreckage was in a space 60 feet long and 20 feet wide, with a few parts or components beyond and from that area. From the first contact with trees to the most distant part of wreckage was 475 feet. That had ignited and killed the linkage.

Three bodies are scattered around the wreckage, in four circles. All others are in scattered.

SAFETY



MAP shows site of PV-1 crash near Jeffersonville, Ind., during approach.

of safety tests and remained in ground before it happened. There was no evidence of structural failure in any portion of the wreckage.

Study of the wreckage showed and big security wreckage indicated that the landing gear and some doors were attached at the point of impact. Nothing whatever was found in aircraft or even against that there had been malfunctioning of the, as far as any of its components in one hour, to impact.

Although much of the radio equipment of the aircraft was damaged almost beyond recognition it was possible to determine some of the present wreckage.

The left ADF station, located at 160 ft. The station switch was on transmit position. The Louisville Kentucky frequency range is 114 ft. The given VHF control had been completely damaged and no reading was obtainable from the, the station switch was on transmit position. The ADF station indicated aircraft cable was completely destroyed.

The No 1 ocean bearing compass selected indicated 120 degrees. The bearing and glide path were destroyed. The No 2 ocean bearing compass selected was destroyed. The compass selected from the Louisville VOR, the Jeffersonville station is 512 degrees.

The VHF NAV-1 arm was tuned to 118.7 mc. The ILS frequency of Standard August Louisville Kentucky is 118.7 mc. The VHF NAV-2 arm was at 112.1 mc. The frequency of the Louisville ocean range is 112.1 mc.

The VOR frequency selected was 121 mc. The last digit following 121 was

not legible. The communication tower frequency is 121.5 mc. The Standard ground control frequency is 121.5 mc. The VHF tower was tuned to 120.6 mc. The Standard approach control frequency is 121.5 mc.

Inspection disclosed that all present ground radio facilities were functioning so much as the time of the accident.

Carburetor Heat

Both carburetor heat controls were found in the closed or not in position (carburetor heat controls "off"). These controls, as designed, the carburetor heat control only slightly from the closed.

The carburetor heat control switch had not been modified on the installation to permit intermediate positions (opening carburetor heat control to the closed position of carburetor heat control). Both the carburetor and the carburetor controls were completely destroyed.

Use of full carburetor heat on fuel jet power is not recommended for the sub trip, except in cases of emergency. Carburetor heat is not recommended if induction stage is contaminated.

Radio contacts between the aircraft and ground stations during the flight were as follows:

At 0700 the flight left Louisville.

The aircraft was in contact with the Louisville radio station at 0700, 0710, 0720, 0730, 0740, 0750, 0800, 0810, 0820, 0830, 0840, 0850, 0900, 0910, 0920, 0930, 0940, 0950, 1000, 1010, 1020, 1030, 1040, 1050, 1100, 1110, 1120, 1130, 1140, 1150, 1200, 1210, 1220, 1230, 1240, 1250, 1300, 1310, 1320, 1330, 1340, 1350, 1400, 1410, 1420, 1430, 1440, 1450, 1500, 1510, 1520, 1530, 1540, 1550, 1600, 1610, 1620, 1630, 1640, 1650, 1700, 1710, 1720, 1730, 1740, 1750, 1800, 1810, 1820, 1830, 1840, 1850, 1900, 1910, 1920, 1930, 1940, 1950, 2000, 2010, 2020, 2030, 2040, 2050, 2100, 2110, 2120, 2130, 2140, 2150, 2200, 2210, 2220, 2230, 2240, 2250, 2300, 2310, 2320, 2330, 2340, 2350, 2400, 2410, 2420, 2430, 2440, 2450, 2500, 2510, 2520, 2530, 2540, 2550, 2600, 2610, 2620, 2630, 2640, 2650, 2700, 2710, 2720, 2730, 2740, 2750, 2800, 2810, 2820, 2830, 2840, 2850, 2900, 2910, 2920, 2930, 2940, 2950, 3000, 3010, 3020, 3030, 3040, 3050, 3100, 3110, 3120, 3130, 3140, 3150, 3200, 3210, 3220, 3230, 3240, 3250, 3300, 3310, 3320, 3330, 3340, 3350, 3400, 3410, 3420, 3430, 3440, 3450, 3500, 3510, 3520, 3530, 3540, 3550, 3600, 3610, 3620, 3630, 3640, 3650, 3700, 3710, 3720, 3730, 3740, 3750, 3800, 3810, 3820, 3830, 3840, 3850, 3900, 3910, 3920, 3930, 3940, 3950, 4000, 4010, 4020, 4030, 4040, 4050, 4100, 4110, 4120, 4130, 4140, 4150, 4200, 4210, 4220, 4230, 4240, 4250, 4300, 4310, 4320, 4330, 4340, 4350, 4400, 4410, 4420, 4430, 4440, 4450, 4500, 4510, 4520, 4530, 4540, 4550, 4600, 4610, 4620, 4630, 4640, 4650, 4700, 4710, 4720, 4730, 4740, 4750, 4800, 4810, 4820, 4830, 4840, 4850, 4900, 4910, 4920, 4930, 4940, 4950, 5000, 5010, 5020, 5030, 5040, 5050, 5100, 5110, 5120, 5130, 5140, 5150, 5200, 5210, 5220, 5230, 5240, 5250, 5300, 5310, 5320, 5330, 5340, 5350, 5400, 5410, 5420, 5430, 5440, 5450, 5500, 5510, 5520, 5530, 5540, 5550, 5600, 5610, 5620, 5630, 5640, 5650, 5700, 5710, 5720, 5730, 5740, 5750, 5800, 5810, 5820, 5830, 5840, 5850, 5900, 5910, 5920, 5930, 5940, 5950, 6000, 6010, 6020, 6030, 6040, 6050, 6100, 6110, 6120, 6130, 6140, 6150, 6200, 6210, 6220, 6230, 6240, 6250, 6300, 6310, 6320, 6330, 6340, 6350, 6400, 6410, 6420, 6430, 6440, 6450, 6500, 6510, 6520, 6530, 6540, 6550, 6600, 6610, 6620, 6630, 6640, 6650, 6700, 6710, 6720, 6730, 6740, 6750, 6800, 6810, 6820, 6830, 6840, 6850, 6900, 6910, 6920, 6930, 6940, 6950, 7000, 7010, 7020, 7030, 7040, 7050, 7100, 7110, 7120, 7130, 7140, 7150, 7200, 7210, 7220, 7230, 7240, 7250, 7300, 7310, 7320, 7330, 7340, 7350, 7400, 7410, 7420, 7430, 7440, 7450, 7500, 7510, 7520, 7530, 7540, 7550, 7600, 7610, 7620, 7630, 7640, 7650, 7700, 7710, 7720, 7730, 7740, 7750, 7800, 7810, 7820, 7830, 7840, 7850, 7900, 7910, 7920, 7930, 7940, 7950, 8000, 8010, 8020, 8030, 8040, 8050, 8100, 8110, 8120, 8130, 8140, 8150, 8200, 8210, 8220, 8230, 8240, 8250, 8300, 8310, 8320, 8330, 8340, 8350, 8400, 8410, 8420, 8430, 8440, 8450, 8500, 8510, 8520, 8530, 8540, 8550, 8600, 8610, 8620, 8630, 8640, 8650, 8700, 8710, 8720, 8730, 8740, 8750, 8800, 8810, 8820, 8830, 8840, 8850, 8900, 8910, 8920, 8930, 8940, 8950, 9000, 9010, 9020, 9030, 9040, 9050, 9100, 9110, 9120, 9130, 9140, 9150, 9200, 9210, 9220, 9230, 9240, 9250, 9300, 9310, 9320, 9330, 9340, 9350, 9400, 9410, 9420, 9430, 9440, 9450, 9500, 9510, 9520, 9530, 9540, 9550, 9600, 9610, 9620, 9630, 9640, 9650, 9700, 9710, 9720, 9730, 9740, 9750, 9800, 9810, 9820, 9830, 9840, 9850, 9900, 9910, 9920, 9930, 9940, 9950, 10000.

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Pratt & Whitney Aircraft

Division of United Aircraft Corporation
East Hartford, Connecticut

SAFETY

rest. The in some distance from point of impact the engine was 245 inches, an average groundspeed of 163 knots.

All fuel tanks had been filled to capacity of 1,000 gallons in the day preceding the accident and that tank was then four to five hours. Fuel was not added for the engine light on the following day. The aircraft was caught at the time of the accident, based on fuel tank, is estimated at 27,740 pounds. Since the fuel capacity is 1,000 gallons it appears that this was 416 gallons above the capacity at the time of the crash.

Left Carburetor

Examination of the propellers was conducted as thoroughly as their built design conditions would allow. There was no indication of internal failure in either propeller except for an irregularity in the left carburetor which will be detailed later. There was no indication of lack of lubrication in either propeller.

All propeller blades were bent in varying degrees, some slightly forward and some backward. Some of these blades were cracked by contact with loose parts in as well as other aspects.

The close planes of both propellers were examined carefully to determine the propeller pitch at impact. However, this was not made possible since the propellers were not in the same position as they were at impact. The propellers were found to be bent 14 degrees in the left propeller and 14 degrees in the right propeller and 14 degrees in the right propeller.

Examination of components of the left propeller bearing system revealed that it was severely damaged during impact. In fact, examination revealed the evidence to indicate failure of multiple operation. The right engine propeller shaft splines were, apparently, damaged, indicating high-impact forces at the moment of impact. This type of damage was not found in the left engine.

Linkage Detached

The left carburetor shaft control lever linkage had become detached from the carburetor at the throttle shaft. This, too, was the case of the linkage, was found open slightly beyond its normal opening with no apparent marks of impact damage. There was no visual evidence of disintegration of the left fuel tank. A 1/2 inch hole with a conical hole and a hole in the wall to attach the disintegration also led to the throttle shaft linkage. Any impact loads sufficient to remove the fuel from the linkage could be expected to initiate the disintegration after that.

The design of the carburetor system is such that the shaft will pull due to the disintegration and part to the carburetor will be enough fuel to allow starting when the throttle linkage is disconnected. The disintegration link was the only apparent irregularity found in either propeller.

plant. Examination of the engine after occurrence of both engine failures for power output as well as bench testing of those that were sufficiently free of impact damage revealed no pertinent irregularities. Cooled temperatures based on reports on observations indicate the temperature at 400 F at 1,000 rpm and 50 F at 1,000 rpm at 1/2 inch. The time and place of the accident were the latter portion of the war zone.

The results show that the left engine, as it occurred, was accelerated by a C-3 approved propeller system March 15, 1955. At the time of the accident the engine had required 254 hours since that accident. On January 12, 1956, the last 150 hours before the accident occurred. During the inspection no irregularities were noted.

The engine had required approximately 50 hours since the last 150 hours before the accident occurred. During the inspection no irregularities were noted. Examination of all available maintenance records of the engine and of both propellers indicated no significant irregularities or anomalies. All maintenance was carried out as far as could be determined.

Pilot Report

A pilot report on the crash of the left engine was obtained from the pilot. The pilot reported that the engine was running at 1,000 rpm at the time of the crash. The engine was running at 1,000 rpm at the time of the crash. The engine was running at 1,000 rpm at the time of the crash.

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Mark of a New and Deadly Guided Missile



"Sidewinder" is the Navy's newest air-to-air guided missile. Flight tests have proved the missile to be as vicious as the enemy machine for which it was made.

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well beyond reach of the target aircraft's defense.

"Sidewinder" was developed by the Naval Ordnance Test Station of the Navy Bureau of Ordnance at Chino Lake, California. Philco assisted NOTS in the research and development program, and performed the subsequent engineering required for manufacture of the missile. "Sidewinder" is now in full production at the Philco Government and Industrial Division.

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In our recent advertisements, we spoke of the growth opportunity offered by Arma. Almost immediately, prospective engineers began writing us, asking for more information.

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Our answer, in a word, is diversification. Arma offers one of the broadest programs of work diversification in the electronics field.

At Arma, an engineer follows a path from original design, right through final production. As a result, our engineers find opportunities are exposed to many activities not usually found under one roof—areas into which they can grow, as their abilities and interests lead them.

Here are some of the areas—in which Arma encourages its efforts in:

MISSILE CONTROLS & GUIDANCE AND FIRE CONTROL

1. SYSTEMS DEVELOPMENT

- 1.1 Night Fighters
- 1.2 Air Control
- 1.3 Radar
- 1.4 Anti-aircraft Systems
- 1.5 Bombers
- 1.6 Naval Fighters
- 1.7 Missiles & Rockets
- 1.8 Fire Control
- 1.9 Systems

2. PROJECT ENGINEERING

- 2.1 Airborne Fire Control
- 2.2 Missile Guidance
- 2.3 Radar
- 2.4 Anti-aircraft Fire Control
- 2.5 Bombers
- 2.6 Naval Fighters
- 2.7 Missiles & Rockets
- 2.8 Fire Control
- 2.9 Systems

3.0 TESTING EVALUATION

- 3.1 Test Evaluation
- 3.2 Test Evaluation
- 3.3 Test Evaluation
- 3.4 Test Evaluation
- 3.5 Test Evaluation
- 3.6 Test Evaluation
- 3.7 Test Evaluation
- 3.8 Test Evaluation
- 3.9 Test Evaluation

4.0 SYSTEMS ENGINEERING

- 4.1 Systems Analysis
- 4.2 Systems Design
- 4.3 Systems Testing
- 4.4 Systems Research
- 4.5 Study
- 4.6 Error Analysis
- 4.7 Reliability

5.0 COMPONENTS

- 5.1 Transistors
- 5.2 Vacuum Tubes
- 5.3 Diodes
- 5.4 Capacitors
- 5.5 Inductors
- 5.6 Resistors
- 5.7 Transformers

6.0 RADAR

- 6.1 Radar Systems
- 6.2 Radar Design
- 6.3 Radar Testing
- 6.4 Radar Research
- 6.5 Radar Study
- 6.6 Radar Error Analysis
- 6.7 Radar Reliability

7.0 PROJECT ADMINISTRATION

- 7.1 Project Planning & Control
- 7.2 Subcontract Management
- 7.3 Contract Administration
- 7.4 Project Coordination
- 7.5 Project Evaluation

8.0 DIGITAL COMPUTERS

- 8.1 Digital Design
- 8.2 Digital Testing
- 8.3 Digital Research
- 8.4 Digital Study
- 8.5 Digital Error Analysis
- 8.6 Digital Reliability

9.0 ENVIRONMENTAL

- 9.1 Physics
- 9.2 Mathematics
- 9.3 Statistics
- 9.4 Engineering
- 9.5 Research
- 9.6 Study
- 9.7 Error Analysis
- 9.8 Reliability

10.0 MISSILE GUIDANCE

- 10.1 Guidance Systems
- 10.2 Guidance Design
- 10.3 Guidance Testing
- 10.4 Guidance Research
- 10.5 Guidance Study
- 10.6 Guidance Error Analysis
- 10.7 Guidance Reliability

If you want to participate in the growth that comes from a rich working life as diversified as an environment, write and tell us the area in which you're most interested. (We use the ranges below.) Your confidence will be rewarded, and you will hear from us promptly. If you prefer, direct-mail confidential response. No reference contact without your permission.

Technical Personnel Department • 671

ARMA

Division of American Bosch Airco Corporation
Research Field, Garden City, Long Island, N. Y.

☐ Please send me additional information concerning the job mentioned.
☐ The additional information concerning the job of _____
 is of _____
 interest to me and I will be sure to reply.
 NAME _____
 ADDRESS _____
 CITY _____
 STATE _____

SAFETY



UNIT is used case of an cabin has small heater controls used in some switch, pressure switch and indicator plates in sensitive spots in control. Heater control device plate color to indicate source of failure.

Long lights automatically in the pilot's cabin when the abnormality first takes place.

The unit consists of a number of small heater controls which are used to reactivate, pressure switch and indicator plates in the sensitive spots in the aircraft. When a failure occurs, the heater control device plate color to indicate source of failure.

Sequence is indicated by the amount of illumination that takes place in each cartridge.

The sequence time for a sequence to be recorded is less than three seconds.

If more than one failure occurs, the amount of light flowing through each cartridge will be the same function of the sequence of light available in other words of a second failure occurs in a second after the first, each heater control will be new sequence but the sequence remains.

If a third failure occurs, each cartridge will consume a third cartridge, and so on.

Unit can be removed from the aircraft after each flight for inspection.

The absence of recorded evidence, of course, will mean a complete normal flight.

All type of crash, and crash into water.

It is located in a specially designed hull which is designed, shock proof, bomb and self-sealing. Engine lights and detectors are in hull effect. Total weight of device is four ounces, that of which unit 10 lb.

Unit has own source of electric power is non-flammable battery. It requires little or no maintenance, as it only operates in case of failure and the visual detectors have no moving parts.



Opening—

for minds with 20-20 vision

THE ABILITY to see clearly with the mind's eye is characteristic of most good engineers. Nowhere is it more highly prized than here at Goodyear Aircraft.

Our creative engineers are men of talent and training, of course. But beyond that, they are men filled with an accuracy capacity to look ahead, think ahead and above all, see ahead.

Their materials are the progress of the past. Their genius is the promise of the future.

To fulfill that promise, our engineers have at their disposal the most modern facilities, including one of the largest computer laboratories in the world. They have unlimited opportunities in the field of their choice—whether it be aerodynamics, missiles, electronic guidance equipment, structures—or countless other challenging activities.

There are no limits, either, on individual thought, no barrier to the flow of inspiration.

If you have both in your ideas and confidence in your ability to make them work, a rewarding career can be

your own at Goodyear Aircraft. Our continued growth and diversification have required expansion of our engineering staffs in all specialties at both Akron, Ohio, and Livestock Park, Arizona.

You'll find salaries and benefits agreeable. If you wish to continue your academic studies, company-paid tuition courses leading to advanced degrees are available at nearby colleges.

For further information on your career opportunities at Goodyear Aircraft, write Mr. C. J. Jones, Personnel Dept., Goodyear Aircraft Corporation, Akron 15, Ohio.

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The Team Is Team Fish in Aerodynamics



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COMPUTER SYSTEMSNEW CIVIL AVIATION
PRODUCTSJET AND TURBO-PROP
ENGINE CONTROLSAEROSPACE FIRE
CONTROLS**ON CAREER OPPORTUNITIES IN**Systems Engineering and Analysis
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Field Engineering

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Superior of Technical Employment**AG SPARK PLUG DIVISION
THE ELECTRONICS CORPORATION****GENERAL MOTORS CORPORATION**

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Flint 2, Michigan

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Every advertisement printed in the Employment Opportunities Section is duly authorized.

It will help to keep our readers interested in this advertising if you will acknowledge every application received, even if you merely return the letters of unsuccessful applicants with "Position filled, thank you" written or stamped on them.

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SAC 100-100-100

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FLYING SALES EXECUTIVES

Exceptional opportunities exist now for qualified, experienced salesmen who would like to supervise and direct the sales organization work in a fast growing business aircraft market within key regions of the U. S. Those who have executive management experience necessary to initiate and administer sales programs in the field, and who are qualified pilots, should send complete resumes and recent photo to Robert J. Goss, Marketing Manager, Commercial Sales, Beech Aircraft Corporation, Wichita 1, Kansas.

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Slowly, in processing welded pipe, the weld is made at the top. But gravity plays a nasty trick. It tugs at the fluid metal in the weld zone, pulling it down toward the middle of the pipe. The result, particularly in the seams, gives us a perceptible bulge where it hurts the most - right on the inside surface. If you try to get rid of the bulge - at face end - the metal is undercut - and corrosion and erosion start there.

why there's NO BEAD—NO UNDERCUT

But Trest put a stop to that — simply by going into partnership with gravity. With their exclusive Contour-Welding process, they weld at the bottom — and gravity works for them. For them, the bulge is in the opposite direction — bending in perfectly with the contour of the nose itself.



...with new **CONTOÛR TRENTWELD**

New Contour-Trendweld stainless pipe and tubing is so smooth, both inside and out, that you can't even feel the weld. It's stronger, more uniform, with no place for corrosion or erosion to get a toe-hold. And it's available in any size or pipe . . . in all stainless, high-alloy, Hastelloy and titanium grades that can be welded.



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AVIATION: WEEKLY, MARCH 18, 1957

[illegible]

ENGINEERS, SCIENTISTS:

What did they say the last time you had an

IDEA?

At Doman, we talk to hundreds of engineers, and many report that breaking it is when they make a good constructive suggestion and are greatly bothered that "ideas" are the responsibility of others. Strangely enough, these same companies often talk about "creative engineering" in their recruiting ads! Fortunately the attitude is not typical of most progressive companies today.

We know many companies who encourage and appreciate creative thinking... who know that youth, innovation and progress all go together.

Whether you're feeling seriously about thoughtless stress. Because can improve your job perspective confidently and stress out to you. We will send reproductions of your resume (without your name) to the hundreds of top ranking firms—our client-base pay us to find good men. And, we will under your name and resume in our premier Decision Register, which we search daily to find engineers for specific job openings.

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Dear Mr. Burdoo:
I do have good ideas, and I want
to find out why people think I

SAGE _____

[illegible]

100/100

STREET _____

488

姓名: _____

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关键词：网络；网络广告；网络广告效果；网络广告效果评估

CONFIDENTIAL



Levelhead and the Night

"Levelhead, Levelhead, scramble now, scramble!"
The alarm of the night is broken by the bell.
Great crowd near, the pilot leaps, the time is needed.
The night selects again this sudden hour of

unusual activity

But sleeping nature want awaken too,
For when does nature sleep if time seems otherwise?

The pilot disappears fully into the powerlessness of the night
The wheel of the spinning turbine ceases its rotation,
And then again beyond the range of human scientific,
The huge engine does sensuously stop again,
The run at the forward track out the night
And, facing it back, leave a new surprise.

Unsuspecting however, leaving the shock of night,
The husband says, as he leaves his child cry,
"These damn fathers must have their share and
ask us all at sleep."

Another pilot—off duty—thinks—
"These poor fell—may God be with him
One mile an hour fully in the running of the jet
"Dear God, he lend to Levelhead and country, but
especially Levelhead—"
Despite their heavy burden, the world of pilots respect
the night

"Trust, Levelhead, and now scramble now!"
"Repeat, Levelhead, in one—three now, stand clear,
old Doc now."

The pilot looks at the glowing dial—
Instruments that look like children's head of bell
"The pilot, had pressure, checks, and at last comes"
The shockwaves split the night in two

The husband leaves the night slip back and loses
The other pilot doesn't a fifth dream
The child whimpers, then sleeps
The wife looks at the clock and waits
The night waits too, for at the zone of time darkness,
The night waits to rule once again, and swallow up
the night

Sometimes holes, a tiny white spark, on a radio scope
moves reflectively
Slowly but definitely toward the city—
Toward the husband more again asleep—
Toward the child now quiet—
Toward the father and the wife watching the clock—
Toward the train operator who watches the scope

The radio operator speaks to the night, and
the night selects his message
"Levelhead, Doc, Vector now in air, angle thrust"
"Repeat your twice a clock, then"
The pilot, now released, thinks of thrust angle—
Inertia ceases to hum from each an angle very cool
Thinks of the color, Doc, very red
But to the night at Angle thrust, only the night is real

Now there are two more speeds on the scope,
concealing rapidly
Through the night came the serene reach of the pilot—
"Doc, I have contact"
"Doc, I have jetty"
"Doc, fully in, finally"
The radio operator breathes a deep sigh and takes down the
mission at the end of night
The pilot of the aircraft comes himself and the night
Both for having stayed and naming Levelhead to scramble

The husband sleeps—the child sleeps—the wife sleeps,
While the wife watches the clock for the night is
wide awake
The pilot watches his fuel for the night is
wide awake and black
"Levelhead, Doc, Repeat two more now, our focus"
The night watches the plane speak the message
The pilot falls to sleep with Doc at his right for him

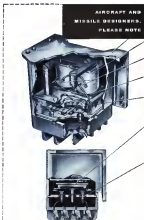
The night at the author is shattered again.
The husband awakes once more.
The child cries
for the wife sleeps—
The city sleeps
The city sleeps in peace because
Levelhead destroyed the night.

—MARC ROBERT PERLIN

FORNAT NARR: ARTHUR WERN is pleased to publish this poem by
led by led by Mark Robert Perlin, USAF Lt. Colonel, was an
all-weather fighter pilot in the Delaware County, Pa. F-4D
out of McGuire AFB, N. J. Like some other pilot pilots, Lt.
Perlin kept to machine, riding and flying. He planned to
return to the University of Michigan after his term of USAF
active duty to complete his academic degree. Lt. Perlin died at
the age of 27 in the crash of his F-4D after its jet engine flamed
out on a GCS approach to McGuire. The jet was slowing from a
possible after undetected engine failure to the engine at "level
lead."

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